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WE were brought to a realizing sense of the change which the due process of development has effected in the *American Architect* when, in having the copies for the half year just passed bound up for our own use, we discovered that the Imperial edition, at least, had become so bulky that it would be very undesirable that the issues for a full year should be bound in one pair of covers. We have, therefore, made preparations for binding this edition in semi-annual volumes, and though this step may entail some extra expense on those who follow our example, we believe that they will find, as we do, that the convenience of having another bound volume ready for use at the end of each six months is well worth what it costs. We regret that we cannot make the price of binding any less for the half-yearly volume than it has been for the yearly volume, but the fact is that the number of double-page plates which require mounting on guards is so great that to do the work properly requires careful handling and much time, so that there is little margin for profit to any one. Moreover, the semi-annual volume of the Imperial edition contains about as much matter as the first yearly volume published, for which our binding prices, since unchanged, were established.

ANARCHY received a warning last week at Chicago, which must have shown the least thoughtful amongst the brutal enthusiasts that in this country the times are not ripe for the success of their idea, and that there are as yet not sufficient causes to induce the great laboring classes to join hands with the professional agitators. The fire is smothered but not quenched, and it will depend somewhat on the self-control of the monied classes how soon their poorer fellows shall find themselves unable to longer contemplate unmoved the unequal distribution of the good things of this life. It is possible that the spread of education and the opportunities of graduating from one class to another which this great free country offers to all, may always keep the good sense of the community above the danger line, above the fire-damp of social revolution which, nevertheless, will from time to time doubtless catch fire in one section or another, owing to strictly local causes. It is not, however, possible to conceive that anarchy can ever receive here the glorification which posterity accords to the most famous anarchical movement of all passed time — the French Revolution. There was cause, reason, purpose for such a movement in a country and time when all who were not of the aristocracy were the mere scum of the earth. But in a country of which the chief magistrate may rise by peaceful and lawful steps from the tow-path, the tannery or the lumber camp to the most honored office in the gift of the people, it seems probable that the members of the laboring classes will see that their chances of success depend on their own force of character, more than on extraneous circumstances, and that they will hence always join hands with the middle and wealthy classes in suppressing anarchy whenever it shows its head.

IN France, however, though the Communist of to-day is deserving only of the bullet or transportation, the Revolutionist of a century ago is worthy of all honor, and a movement is now making at Paris to celebrate the outbreak of 1789 by the erection of a fitting monument. The historical association of ideas, the sentiment of special appropriateness and the opportunity all unite in pointing to the site of the palace of the Tuileries as the one most suitable for the proposed monument. After remaining for some half-a-dozen years the blasted relic of the madness of the Commune, the palace of Philibert Delorme was at length torn down and its material sold at auction to relic-hunters from all parts of the world, some fragments even finding their way to this country. What should be done with the site has been frequently discussed, particularly since the new street has been cut between the Rue de Rivoli and the Quai des Tuileries, which makes the vacancy even more apparent, and the desirability of the site more evident. The space between the Pavillon de Flore and de Marsan has been utilized by erecting temporary buildings for the use of the municipality, and for the post and telegraph office, until it shall be finally determined how the site can be turned to the best use. Recently M. Chassin, a publicist, suggested that in view of the approaching centenary of the Revolution it would be well to erect a monument in commemoration of the event, and that the best form to give the monument would be that of a museum where could be gathered together all the souvenirs of that epoch that could be collected, the portraits, medals, paintings, archives, memoirs, biographies and all the thousand and one miscellaneous articles that have been treasured in private families or scattered through public institutions. As for the site for the proposed museum, M. Chassin asserted that none could be so suitable as that where the Tuileries formerly stood. The suggestion pleased both the public mind and the official inclination, and it seemed as if the scheme would be carried out without delay. But the Minister of Public Instruction, M. Goblet, who at first was entirely in favor of the project, declared, when it came to the point of expressing himself officially, that the assistance of the Government could not be assured until the plan had been more thoroughly studied both as to cost, and as to the architectural character which was to be given to the building, and next that so far as the site was concerned, it seemed to him to be much larger than was needed for a building whose contents could neither be very numerous nor bulky. This announcement, which seems to us to be very sensible, appears to have thrown the promoters of the scheme into unnecessary consternation.

A SHORT time ago a number of owners of much valuable real estate and the representatives of some of the fire-insurance companies petitioned the Boston Water-Board to extend the high-service system so as to afford a better protection to the valuable buildings in the neighborhood of State Street and Post-office Square, and we have no doubt that the appeal thus made will be ultimately successful. Of immediate result we suppose there is small hope, as we suppose funds for the execution of the work would have to be provided by the city government, which is understood to give its attention mainly to the making of a reputation for economical administration, with a view to its own reëlection, rather than to a judicious consideration of the best interests of the city, which are temporarily entrusted to their care. This petitioning by men of weight in the Boston community is an amusing instance of the different ways in which things are done in that city and in New York. In New York the cart is put frankly before the horse, the job is everything, the needs are often factitious. When, in New York a year or two ago, the bosses found themselves obliged to find work for their adherents and a means of lining their own pockets, they devised the necessity of supplying the city with more water, so that their followers might find employment in the great aqueduct now building, and they might make a profit through handling the contracts. A water-famine was skilfully talked up, and the danger to health and property was portrayed with all necessary vividness; but as material evidence was needed, they procured it in such a form that the supply did seem inadequate and failing, the pressure on the main being sufficient only to carry water to the first floor of buildings, to the upper stories of which it had formerly found its way. The evidence was irrefutable, the need self-evident, and the aqueduct work put in hand. This safely effected, the manipulators

saw no further need of keeping the city on short commons, and the normal pressure was once more allowed to have its effect, and water once more flowed from arid taps and faucets. The new aqueduct is, of course, a very far from useless municipal enterprise, although it is doubtful whether it is yet actually needed, but the means employed to bring it into being are none the less amusing. Boston only seeks to have the present high-service extended so as to serve portions of the city which have always lacked the convenience and protection that other parts of the city have enjoyed for years.

BECAUSE of what we said last week about the Bennington Battle-Monument, Mr. Rinn, the author of the accepted design, found it worth while to bring us a large scale-drawing of the monument as it is now proposed to execute it, for the purpose of showing us that our comments of a year ago were not inappropriate or misapplied, and that our remarks last week, while depicting fairly the original design, which, it seems, is the one of which we saw a photograph, did not describe the latest phase of the design. How far the refinement of line, which is of so much value on paper, will be effective in execution in walls of split-face work, we hope some time to have a chance of observing; but we fear that even if in itself it is successful, it would be more so on a site where its qualities would tell for all they are worth; that is, we have a feeling that the obelisk is not the best form to adopt for a site such as we understand the one at Bennington to be. It seems to us that a three-hundred-foot shaft of the proportions chosen will look too thin and needle-like, and that in the absence of anything to give it scale it will lack that which gives to the Bunker Hill shaft whatever it possesses of interest as a structure, if not as a design.

THE English engineers are considerably exercised over the fact that the contract for a large iron bridge in Australia, to cost two million dollars, has been awarded to an American bridge-building company, but, with their usual fairness, instead of trying to depreciate their rivals, they seem to be endeavoring to learn for their own improvement the reasons for the superior economy of the American methods of bridge-building. The principal reason, which includes, perhaps, all the rest, is certainly to be found in the great experience which American specialists have had for the past twenty years in bridge construction. With us the work of designing iron railroad or highway bridges rarely falls, as in Europe, upon engineers in general practice. The volume of the bridge-building business in a country which builds three or four thousand miles of railway a year, and reconstructs nearly as much more by the substitution of iron for wood in the smaller bridges on the line is so enormous that it has become a specialty in the hands of five or six great corporations which employ at high salaries the best engineers to be had and maintain immense foundries and rolling-mills where nothing is done except to manufacture eye-bars, lattices and the other members of bridge construction. The competition between these corporations is so great that the ingenuity of their engineers is taxed to the utmost to reduce the weight and cost of the bridges which they design to the lowest point consistent with safety, while the correctness of their construction is practically guaranteed by the same rivalry between the managers of each corporation, always on the alert to discover defects in the work of the others, and the natural consequence is that the skill of men of ability concentrated for years in sharp competition with others of equal ability upon a single subject, has produced its natural result in bringing to great perfection the details of all the processes relating to that subject.

THE most obvious difference that the English engineers find between their own systems of bridge construction and that of the American engineers consists in the extensive use of eye-bars by the latter for all members which have to endure a tensile strain. It is usual in American bridge-building shops to lay out the lengths of the different members with great accuracy, one sixty-fourth of an inch being, we believe, the maximum variation allowed, and eye-bars which are gauged and drilled at the shop and put together with turned steel pins can be fitted with far greater accuracy and are therefore put together on the ground much more quickly and securely than the old-fashioned riveted members which are still used abroad for resisting tensile strains. Although the Americans have sometimes been reproached for allowing the safety of their bridges to depend upon the strength of a single pin or bolt instead of securing them by a multitude of rivets, the failure of one of which would not involve the ruin of the structure, the construction with pin-joints allows, or rather invites a care and accuracy in the inspection of every part which, perhaps, do more to promote real security than the habit of depending upon the indefinite and uncalculable resistance of riveted joints. A correspondent of *Engineering* suggests further that the practice which American bridge-builders have had in designing bridges for single-track railroads has been of value to them by obliging them to take careful note of the wind-pressure upon these narrow structures, and to provide against it by a particularly well-considered system of bracing and strengthening.

WE understand that M. de Lesseps has succeeded in having a large part of his new loan of one hundred and twenty million francs taken up, mainly it is said by females of the peasant class. If half that is said about the real condition of affairs at the Isthmus is true, this enterprising enthusiast is likely to prove one of the greatest moral scoundrels of the age, and we do not envy him the objurgations which, when failure is at length acknowledged, will shower upon him. But there are some things which even the magnetic de Lesseps cannot accomplish, and we are not surprised that in face of the doubtful condition of his undertaking at the Isthmus of Panama the Tunisian Government has refused to allow him to undertake the flooding of the chotts that lie between the coast of the Mediterranean and the great desert to the south of them. M. de Lesseps estimated that the cost of digging the canal that would be necessary for this immense irrigation scheme would be forty million dollars, which he probably looks on as a mere bagatelle, but which the canny Africans seem to believe could hardly be raised by a man who already finds it hard to raise money for the prosecution of an enterprise in which the whole world is interested, and of which the bonds and securities can be bought in any market, if any one thinks them worth the purchase.

IT is reported from Steubenville, Ohio, a town of some twelve or thirteen thousand inhabitants, that for two years one of its main streets has been paved with fire-brick, and, under such traffic as a town of the size affords, has given better satisfaction than any material yet tried, wearing well, being comparatively noiseless, and giving a good foothold for horses. Its chief recommendation, however, seems to be its cheapness, as it costs only eighty-three cents per yard to lay it, as against the two dollars and a half or three dollars which Belgian blocks cost. The bricks are laid on edge, on a four-inch bed of sand, which in turn is spread over a bed of gravel of the same thickness. Paving bricks have been used for street pavement before, but never with very great success, as it did not seem possible to get bricks of even hardness, and just as soon as the softer of the bricks began to give way, the wear at that point increased very rapidly. With fire-bricks it may be possible to secure a more even burning, and perhaps the color of the brick makes it easier to cull out the soft ones. The Steubenville clay may contain an unusual amount of iron, and so makes a more compact and more resisting brick than is to be found in other places, for there are many ordinary bricks that will withstand as high a crushing strain as the common fire-brick.

A LITTLE paragraph has been going the rounds of the technical journals about the painting of tin roofs, which seems to contain a valuable suggestion. Most persons suppose that a tin roof ought to be left exposed to the weather for a month or so, until the iron of the plates has corroded enough to cover the tinned surface with a tinge of rust, probably forced through the pores of the coating. The theory of this notion seems to be that paint will not stick to a fresh surface of tin, which is apt to be greasy as well as smooth, and that the slight roughness given by the rust is of value for holding the paint; but the writer of the paragraph in question believes that if painting is delayed until oxidation has begun, the action continues beneath the coating, until the plates are destroyed, while a layer of paint put on over fresh plates would defend them for an indefinite period from the commencement of oxidation. There is certainly a possibility that this view of the matter is the correct one, and architects, who have many opportunities for observing the weathering of roofs, might do their fellow-citizens a service by investigating the facts with care.

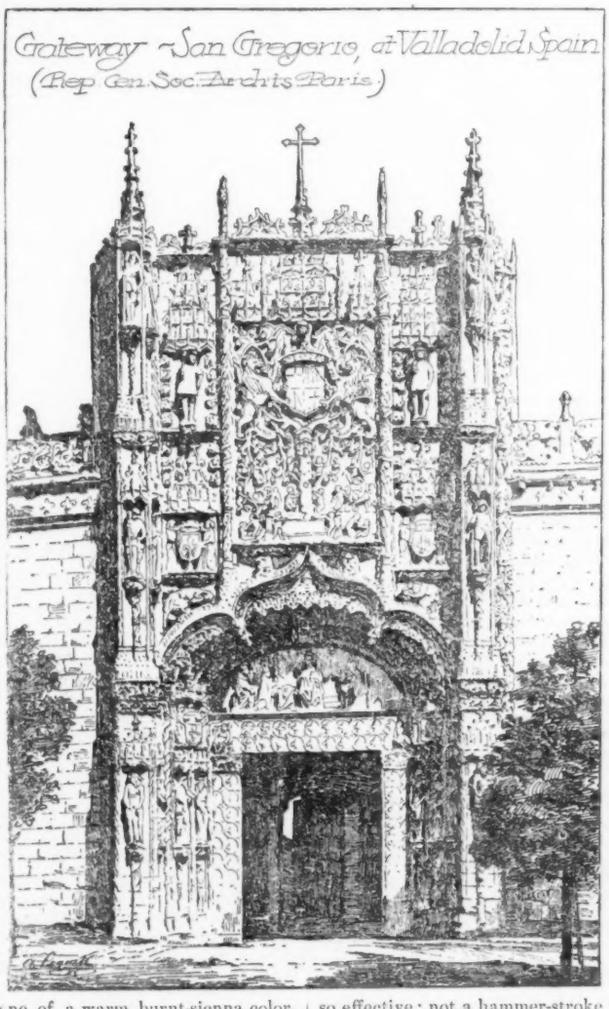
NOTES OF TRAVEL.

SALAMANCA.

Memorial Tablet, Allhallows, Barking (H. London.)
After sketch by Robert W. Gibson.
Architect, 3 York Chambers.

IT is difficult to write or speak dispassionately of Spain, or to measure calmly and fairly the architecture of that wonderful country. Considered from Italian or French standards of taste, a major portion of the work would be pronounced doubtful if not decidedly bad; and yet one never feels like establishing architectural comparisons between Spain and any other country in the world, and the critic must be cold-blooded indeed who would undertake to judge and analyze such examples as the Court of the Lions at Grenada, or the thousand-columned mosque at Cordova. Somehow, even the humbler things become glorified by Spanish associations and surroundings, so that a very little attempt at architectural adornment will seem to count for much more than would be expected anywhere else. And thence it comes that not an artist or architect can visit the country without, to a greater or less extent, losing his head over the delightful surprises that await him in nearly every city of the peninsular. Spain is the paradise of the impressionists, the country of bright, dazzling glimpses, and unexpected, bewildering beauties; sharp contrasts and warm floods of color; a land whose remembrance after a rapid visit could be fairly epitomized by some of the fans one sees in the Madrid shop-windows, decorated with a few shapely figures clad in vivid colors, a mantilla thrown over glossy, black hair, a background of rich, old, sunlit architecture, and, perhaps, at one side the dark shadow of the nation's curse — the bull-fight.

But to most people the name of Spain calls up no other thought than of the fairy-like idyls of Andalusia, the wonderful Moorish architecture. They forget that Spain was ruled by the Goths before Mohamet was born, and that this style, beautiful as it is, was never more than an exotic, whose growth ceased the moment the Moors repassed the Strait of Gibraltar: and even of the many architects who yearly visit Spain — for it is no longer the *terra incognita* it was to the profession a generation ago — few ever go farther north than Madrid; and yet the old kingdom of Leon, up among the northern mountains, is full of interesting and valuable old work, there being hardly a village but has at least one good bit of architecture. Avila, Zamora and Toro are especially well endowed, while chief of all is the ancient city of Salamanca, "*muy noble y muy leal*," as its device reads, a city so full of good architecture and so little disturbed in its quaint old habits and customs by the march of what in Spain is called modern civilization, that for the architect as well as for the simple tourist it can fairly be termed the most interesting city in the whole realm. If there is one other equal to it, it can only be Toledo. The southern cities have one or two buildings to study from, while Salamanca has twenty. In Andalusia, stucco and whitewash take the place of honest masonry, while in Salamanca everything is built with a beautiful, smooth-grained sandstone, of a warm burnt-sienna color, capable of being carved with the fineness of ivory, and resisting the weather so well that even after six centuries of wear the work is as fresh as though cut yesterday; hence, there is none of the dilapidation which meets one at Toledo and elsewhere. The best efforts of Spanish architects have been put forth at Salamanca. The city has not a great deal of work of the periods ante-dating the Renaissance, as the city was in great part destroyed by the Moors about the thirteenth century; but Alfonso VI, and especially their Catholic Majesties, Ferdinand and Isabella, made it so great and rich that wars have passed very lightly over it ever since. It has always been a wealthy city, and the old Spanish traditions have been better preserved here than perhaps anywhere else. The railroad came in only a few years ago, and seems thus far to have made little change in the old ways.



To attempt a detailed description of the city whose architectural riches gained for it at one time the name of the Spanish Rome, would be a task quite outside the limits of this paper. Only a few of the more notable edifices can be considered, and first of these is naturally the cathedral, a great pile erected on the highest ground of the city, rising with considerable grandeur above the house-tops and crowned by its lofty dome. The view shown by the sketch is from a road some distance to the rear of the choir, and is, perhaps, the best that can be had, as the streets are too crooked and narrow to permit of a general survey from any other direction. The cathedral was begun in 1513, and the construction continued through more than two centuries, in a style which is Gothic in all its main ideas, though infused with so strong a Renaissance feeling that it becomes almost a style to itself. It is, indeed, a rather curious mixture. The façade is completely covered with work; the arches at the portals are pointed, and the foliage and mouldings are certainly not Renaissance; but the bas-reliefs and sculptures are almost classic in their purity, and the arrangement of the parts of the façade and the schemes of decoration are as thoroughly Renaissance as anything could be. The effect, while confused and tiresome in its entirety, is pleasing and delicate in detail. The dome, over the centre of the church, is of too late construction to be anything but pure Renaissance. The tall tower at the left has a rather curious history. It was built after the design of Churriguera, an architect who was noted more for the extravagant exuberance of his ideas than for his good taste; indeed, the name *churrigueresco* is used to designate any piece of Spanish architecture which is wildly *baroque* in character. Fortunately, the municipality of Salamanca became alarmed by the terrible earthquake at Lisbon in 1755, and fearing that Churriguera's tower might some day come tumbling down about their heads, they took the strange precaution to encase the lower portion in solid masonry, leaving it as it is now, whereby the effect was greatly improved, as the earlier work was doubtless of a character which would gain by obliteration. The low cupola in front of this tower is a portion of the old cathedral, for Salamanca boasts of two cathedrals. The older building is of uncertain age, but probably dates from about the end of the eleventh century, being entirely Romanesque — perhaps the best and purest example of the style in Spain — and quite equal in excellence to French work of the corresponding period, though a Frenchman would hardly be willing to admit it as such. The mouldings are good and well chosen; there is all the simple dignity which is so pleasing in the French work; the little carving employed is judiciously chosen, and the central tower is really a *chef-d'œuvre* of its kind. In general disposition this tower is not unlike that of our own Trinity Church in Boston, though it is on a somewhat smaller scale. It is circular in plan, with turrets at each diagonal, and slightly projected bays, capped by steep gables. The roof is of stone. The tower is so hedged about by the constructions of the new cathedral, which enclose it on three sides, that it is difficult to find a position from which it can be viewed to advantage. The windows are in two tiers, though the lower is so hidden that it can hardly be seen from any point. The details are thoroughly enjoyable, if such an expression may be applied to architectural forms—so simple and yet so effective: not a hammer-stroke wasted, not a moulding which does not count for all it is worth, not a leaf of carving misapplied or lost; no obtrusive terminations, and yet with no lack of vigor. Well proportioned in every respect, the design is a noble exponent of a noble

style, and an example which no American student can afford to neglect. The old cathedral has been very thoroughly published in the huge and exhaustive work issued in folio by the Spanish Government under the title of "*Monumentos Arquitectonicos de España.*"

The interior of the old cathedral consists of a three-aisled nave, with one transept (the other having been absorbed into the more modern church) and a short apsis without aisles. The design is perfectly plain, there being only a few carved capitols in the nave and a little attempt at design in the interior of the cupola; not very successful, however. The new cathedral was built immediately adjoining the old, the north walls of the latter serving for both, though the sharp rise in the ground necessitated a difference of level between the two of eight feet or more. The interior of the new cathedral is more purely Gothic in character than the exterior, but it has not as much interest, being more precise and mechanical in design, and offering little opportunity for the picturesque. The effect of the tall nave, with its high, slender-shafted piers, might not be bad if one could rightly appreciate it; but, as in nearly all Spanish churches, the view is broken by a high, marble screen of elaborate late Renaissance design, which entirely encloses more than three-quarters of the nave. In plan, the cathedral is three-aisled, with lateral chapels all around.

The chapter-house, built in a rambling fashion about a small cloister adjoining the old cathedral, has a number of attractions: some interesting old woodwork; some early Renaissance furniture, excellently designed; and in a side chapel, enclosing the tomb of one of the early bishops, a tall screen of wrought-iron, the most elaborate and the best of the many good examples of ironwork with which Spain abounds, but, unfortunately, in so dark a place that it can be neither seen nor drawn to advantage, and much less photographed with any success; at least, no photographer has yet been enterprising enough to attempt it, though for that matter not one-quarter of Salamanca has been photographed.

Across the street from the cathedral is the university, an instituton which is but the shadow of what it was in its palmy days. It is asserted to be the oldest of its kind in existence. During the fourteenth century it stood second among the four great universities of Europe — Paris, Salamanca, Oxford and Bologna — and claimed more than ten thousand students. The old buildings and the old systems still remain, but the glory is entirely of the past, and the students number scarcely over three hundred. Architecturally, however, the university has changed but little during the past three centuries and a half. The principal or western façade was erected by Ferdinand and Isabella, and of all the overwrought pieces of work which Spain has produced, this is certainly by far the most elaborate. The disposition is simple enough; below, a double doorway; above, a wall, perhaps thirty feet in height, without a window or opening of any kind, but every inch of the space covered with carved ornamentation. Springing from corbels at each side of the doorway are wide pilasters extended the whole height of the façade. The wall is crossed by two lines of string-courses, and the first and second horizontal divisions above the doorway are sub-divided by pilasters into five panels, filled with armorial bearings, medallion-portraits and finely-designed arabesques. The uppermost division is occupied in the centre by a niche enclosing a group which represents the pope giving sanction and privileges to the University, while on each side are other medallions and more elaborate arabesques. The whole façade is crowned by a rich cornice. But a mere description can give very little idea of the character of the design. It can only be compared to one of those ivory caskets which are sometimes found in museums, carved and ornamented to the last degree; as delicate as lace-work, and often quite as meaningless in general design. But fortunately there is something more than mere quantity of work to this façade. The general effect is fussy, overwrought and tiresome, but each detail is a gem by itself. Indeed, it is astonishing how work of such superior excellence in its parts should be so lacking in comprehensive design. It is a real delight to examine closely the individual features, and note how gracefully the arabesques are adapted to the spaces they occupy, how pure and sharply cut are the mouldings and constructional lines of detail, and how naïve and beautifully composed are the medallion-portraits and reliefs. The large double medallion over the centre representing Ferdinand and Isabella is worthy to rank as the finest carving Spanish artists have ever produced. Not a feature of the façade is neglected; and if one cannot wholly approve of the quantity, the quality of the work will suit even the most exacting critic.

There is less to the interior of the university than one might expect from its past magnificent history. The apartments are arranged about a quaint, sunny, old court-yard. Towards the front is the library, closed off by a handsome wrought-iron grille. On the right is the chapel, hung with rich tapestries, and fitted with good wood mosaics and inlays; and on the left are some of the old class-rooms preserved in exactly the condition they were centuries ago, with the same narrow, wooden benches, and much-be-hacked and carved desks which served when Fra Luis de Leon was the foremost teacher of the land. To the west of the university is the Instituto, formerly an annex of the larger school, a building with an interesting court-yard and an elaborate entrance-way. The property once occupied by the university is quite extensive, but most of it having been converted into dwellings, there is little of architectural value aside from what has been already noticed.

Of the many interesting churches which Salamanca possesses, San Estaban or Santo Domingo is the most elaborate, after the cathedral. The façade has the same fault as that of the university; an excessive richness of beautiful details badly combined. Some of the statues which adorn the font are really excellent, notably a figure of the Virgin which much resembles the celebrated statue by Veit Stoss, in Nuremberg. The interior of the church has the peculiarity, almost unique in Spain, of presenting an unobstructed nave, the choir being installed in a broad gallery over the entrance. The large cloister adjoining the church is quite interesting in its way, lacking the richness which marks the exterior façade, but composed much better and with a general effect which is quite charming. There are few Renaissance cloisters in Europe, and fewer yet which have anything like the picturesque value Santo Domingo possesses. The conditions here are exactly the reverse of what they are on the exterior. The details are not very good nor well chosen, and the whole charm depends upon the general scheme, perhaps also not a little on the effect of the flowers and shrubs growing in wild profusion in the open centre, and on the vivifying influence of the warm Spanish sunshine, which will do so much for bad or indifferent architecture.

The past wealth and importance of Salamanca is well illustrated by the number and the architectural merit of the many private dwellings which still exist; buildings which an Italian would term palaces, but which the Spaniards are content to designate as simple *casas*. The most interesting of these is the famous Casa de las Conchas. [See Illustrations.] A design more thoroughly Spanish could hardly be found anywhere; the Spanish type which knew just when to stop, which concentrated its ornamentation in a few spots; a couple of frost-like iron grilles before the lower windows; a single, wide doorway crowned by a coat-of-arms set in a rich, late Gothic frame; a few tall, mullioned windows, with a little elaboration of tracery in the head, each different from the other, but perfectly harmonious; a flourish of armorial bearings at the angle, and a broad wall, unbroken by the slightest shafting or string-course, but studded all over at regular intervals with boldly-carved conch shells in high relief, emblems of some pious pilgrimage made by the master of the house. In any country but Spain, who would dare do a thing so simple and yet so effective?

The Casa de Maria la Brava is an example of a type which is repeated a number of times in Salamanca; a design which is interesting as showing how a very little work, rightly disposed, can sometimes make a very effective façade, and also as an illustration of the value of a single, broad, round arch, without mouldings or ornament whatever, nothing but good proportions and wide voussoirs. Nowhere else in Spain is the simple, round arch used as effectively as in this city, and there are a number of houses having even less work than the Casa de Maria la Brava, sometimes nothing but the big, round arch and the wide arch-stones, which are full of quiet interest. The Spaniards were never afraid of heavy masonry, and did not hesitate to make the voussoirs even wider than the doorway itself, if they thought an effect was to be gained thereby.

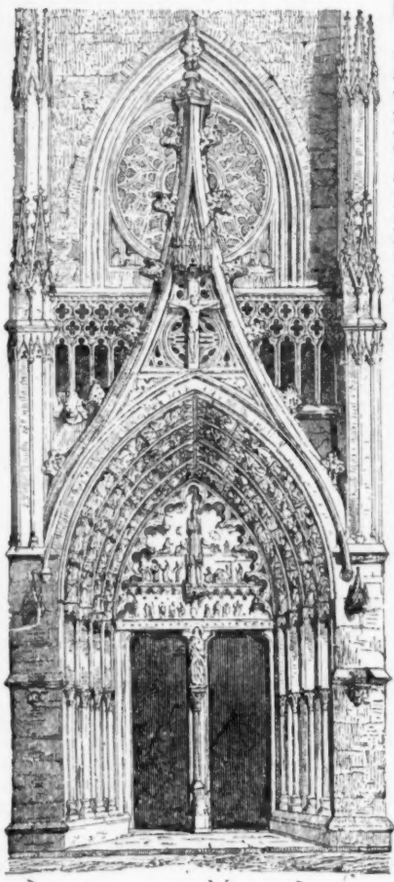
The architectural wealth of Salamanca is fully appreciated by the natives, as well as by the travellers who have had the good fortune to study it. Castalar wanted to make the city the seat of the national architectural academy, which now languishes in bleak, art-less Madrid. Surely no other city of Spain is so well calculated to inspire the student, to give one valuable ideas of good construction as well as of good design, of rich elaboration as well as of effective, studied simplicity, and to one visiting Spain for the first time no better advice can be offered than was given by a leading Madrid architect, a man who knows the country in every detail: leave out Cordova, omit Seville, if you must, but do not fail to study Salamanca.

C. H. Blackall.

Monster Blast of Granite.— Saturday, July 24, was the occasion of one of the periodical blasts which takes place at the granite quarries on Lochfyneside, leased to Messrs. A. and J. Fall, paving contractors, Glasgow. At present two quarries are being worked in the district, one of them being Crarae quarry, near Crarae Pier, and the others being Furnace quarry, between Crarae and Inverary, the seat of the Duke of Argyll. It was at the last-named quarry that the "monster blast" in question took place, the amount of gunpowder employed being 4 tons. An in-going "mine" had been driven to the extent of about 40 feet, and from it there were driven into the rock two diverging chambers or passages to accommodate the powder. The total length of the mining was about 90 feet, the cost of which was about 120*l*. The ignition of the gunpowder was effected by means of an electric dry battery, which was worked in a secluded spot, at a distance of about two hundred yards from the portion of the hillside that was to be erupted. There were a number of workmen's houses in somewhat close proximity to the quarry, and within a short distance of the sea-shore, but they were vacated at the time, the nearest person being the operator of the battery. When the explosion of the powder was effected the whole face of the mountain-side began to move, and the report, which was terrific, loudly reverberated amongst the neighboring hills. It was estimated that the quantity of rock that was removed reached something like 100,000 tons, which will furnish sufficient dressing material to keep the workmen at the quarry employed for the next two years. Another "monster blast" is expected to take place at Crarae quarry toward the end of August. The "head" in this case is being driven 60 feet into the hill-side, and the divergent chambers are to be charged with no less than 7 tons of gunpowder. This system of blasting has now been practised to excellent purpose on Lochfyneside for many years, the originator of it being Mr. William Sim, of Glasgow.—*Engineering.*

AN EDITOR'S TRIP ABROAD.[1]—X.

MUNICH.—NUREMBURG.—FRANKFORT.—COLOGNE.



DOORWAY OF NOTRE DAME DE LÉPINE FRANCE.

CONSIDERING the immense amount of money which has been spent at Munich by the last three kings of Bavaria, in what they probably supposed to be the promotion of architecture, it is surprising that their achievements should have had so little influence upon the current building of the city. In most places any important architectural work is soon reflected on all sides in humble imitation of outline or detail, but the costly classicalisms of Klenze and Gärtner stand solitary in the midst of structures as different in design as they could well be. Even the great Grecian group formed by the Glyptothek, the Propylæa and the Exhibition Building, which might have been expected to influence the character of the new quarter which has recently sprung up around it, looks now, surrounded as it is by streets which might have been transferred there bodily from Berlin, stranger than when it stood in almost open ground. It is perhaps fortunate for the people of Munich that matters turned out in that way, as Classical houses would have cost them a good deal more than those built either after the Berlin model or in the picturesque fashion native to the country; but the difference between this total disregard of the brilliant example set by the king's architects, and the rapidity with which Greek classicism, in particular, spread over England at a little earlier date, is curious. It is rather satisfactory, at least, to find that the mode of decorating important structures with exterior frescoes, which was set in the old Pinakothek, is not likely to be followed hereafter. Even now, nothing remains of Kaulbach's great pictures on the front except a few pale patches, which one with difficulty recognizes as having once been connected; and those on the east and west sides, although in much better condition, show signs of approaching dissolution. The two pictures on the north side are still bright, indicating that the sun is here the most efficient agent in destroying the colors; while the painted tympanum of the Residenz Theatre, which faces nearly west, has lost nearly all trace of the fresco from the lower portion, where the westerly rains, joined to the spattering from the horizontal cornice, have been most effective in washing away the surface.

By far the most satisfactory of the royal buildings in Munich, to my mind, was the little Allerheiligen church, where Klenze was allowed to use his classical knowledge and his architectural capacity together, in composing a small church out of the elements of a Roman bath, or, perhaps, with the features of the later basilicas, which were themselves adapted from the bath construction. Nothing could be simpler than the arcade, of two arches only, which supports the low-domed ceiling, or than the way in which two columns in each bay, separating the nave from the aisles, carry the gallery which runs across at the impost line of the great arches; but it would be difficult to imagine anything more architectural, and even without the splendor of the gold which covers nearly everything above the spring of the great arches, the building would be one of the most effective ever erected.

From the wide, pleasant streets and handsome Renaissance buildings of Munich to mediæval Nuremburg is, materially, a very easy step, and half a day is enough to bring the traveller, tired of palaces and classicism, into the shadow of the tower which guards the narrow gate of Albert Dürer's town. Of all the cities in Europe, Nuremburg must certainly be the one where the sketcher finds most occupation. To say nothing of the endless variety of light and shade afforded by the crookedness, narrowness and steepness of the streets, nearly every house differs from every other in the shape of its roof, its gable or its dormers, its bays, or the way in which it is corbelled over the street, while just enough spice, in the shape of the round towers or battlements of the walls, or a bridge, a church-spire or fountain here and there, occurs among the house-fronts to prevent them from ever becoming tiresome. Moreover, to the constant interest of outline and shadow, which might, perhaps, be approached in some other old cities, Nuremburg adds a beauty of detail in which it must stand unrivalled. It would hardly be too much to say that there is not a house, ancient or modern, inside the walls, which does not exhibit some charming bit, either of carved woodwork or of wrought-iron work, or a clever lead water-spout or gargoyle, or some other effective and original device. In ironwork, more especially, the Nuremburgers may claim superiority to the people of any other place. It would not be surprising, in any German town, to find some pieces of wrought-iron of extraordinary excellence, but here all the ironwork is good, and one finds it everywhere. The meanest house will have its cellar door hung with strap-hinges, whose ends are prettily cut and curled, while its more ambitious neighbor will have a grille at the front entrance composed of bars, not only interlacing in pretty patterns, but flowering at the ends into beautiful rosettes, hammered and marked with patterns, which form extremely delicate yet effective spots on the surface of the grating. Some of the work, as, for instance, the entrance-gate to the "Peller House," shows remarkable skill, not only in design, but in the drawing of the profile faces, which, rudely *repoussé* with the hammer to give them substance, adorn it here and there, and the variety and ingenuity displayed in the more modest examples are almost infinite.

In Nuremburg proper, that is, the city within the walls, there are no new buildings of importance, and those in the new suburbs, outside the gates, although pretty in the way of German city houses, and in some cases very handsome and costly, are not otherwise remarkable, so that it was not until we arrived in Frankfort that there was much material for calm criticism. There is more old work left in Frankfort than I had supposed, and many of the streets, lined with houses which advance over the pavement in three or four successive projections before the gable is reached, are picturesque, even after Nuremburg, while some of the carving on the consoles and brackets which support the projections is extremely effective; but most of the buildings in the city date from a comparatively recent period. The more modest of these, although far from showing the elaboration or the picturesqueness of the old ones, are often very clever in their way. Nearly all the roofing is done with slate, and slates are used with an originality which is full of instruction for those who have to treat shingles in a similar way. Among other things, it is very common to give the gables of the narrower houses a sort of Elizabethan profile, and slate the front all over, down to the level of the cornice, or rather, to a string-course a little higher or lower, forming the coping of the gable also with slates, and slating over the window-frames to the very edges of the openings. The slates not being square, but slightly rounded at the ends, gives a very pretty effect, and in many cases other bands and hoods of slate cross the lower part of the house. In roofing, it seemed to be the universal practice to lay the slates diagonally, at an angle of about thirty degrees with the ridge, according to the pitch of the roof, for the sake of dispensing with metal flashings, which were rarely to be seen. In slating up against the sides of the dormers, as the rows of slate approached the intersection of the side of the dormer and the roof at a right angle, it was only necessary to put a furring, of triangular section, in the angle, to enable the roofer to slate continuously from the roof over the furring and diagonally upon the side of the dormer, trimming off the slates when he arrived at the front of the dormer, and, in the same way, the pitch of the dormer roof was arranged at such an angle as to bring the valley between the dormer roof and the main roof parallel with the direction of the courses, so that the overlapping slates followed each other without a break down the roof, and over the dormer to the edge. The first buildings arranged in this way that I noticed were old ones, and the dormers, from which the slates had considerably decayed, had a picturesqueness which was not without a suspicion of leakiness, but on investigating further, in the Sachsenhausen suburb, I found that the same system still seemed to be held in favor.

The modern part of Frankfort, which far surpasses Munich in its air of wealth and civilization, is full of interesting work. The largest of the new buildings, and one of the most beautiful to be found anywhere, is Lucae's Opera-House, which has a splendid situation, at the junction of one of the most important streets with the long, narrow park which nearly encircles the city. Being surrounded by streets on all sides, it has necessarily four fronts, but each front is a highly-studied and elegant composition, and the two ends are of extraordinary richness. By a happy inspiration, variety is given to the work by making the decoration of the ends depend mainly on shadow and sculpture, heightened, in the entrance front, by the gorgeous coloring of the ceiling of the loggia, which, as in Paris, occupies a position over the doors, while the sides, although ornamented with a very rich order of pilasters, receive their main interest from the beautiful sgraffito decoration, in dark-brown and white, with which their panels are filled. This sort of mixed plaster-work

[1] Continued from page 85, No. 556.

has always seemed to me a dangerous thing to meddle with, and some of the examples that I have seen, by their glaring ugliness, had confirmed me in that idea; but it is used here so boldly and with such admirable skill and success, as certainly to elevate it to a high rank as a means of obtaining architectural effect.

The last German building of special importance which we were to see was, perhaps, the most interesting of all. I did not linger many minutes in Cologne before hastening to see the completed cathedral, and was well rewarded by the first impression of it. Certainly, whatever criticisms may be made in regard to its originality of design, or the merit or demerit of its details, Cologne Cathedral is now the greatest building north of the Alps, if not in the world. Undoubtedly, many of the English cathedrals are more picturesque, and much of the French detail is more interesting, but in neither country is there anything so thoroughly satisfying to the architectural mind as this vast and complete composition. As one stands before it and takes gradually into his mind the nobility of the outline, the skill with which the parts of the enormous spires are held in their due relation to the whole, and the admirable proportion of the entrances, he feels, as he does in the contemplation of none of the mutilated French cathedrals, at least, that, whatever amateurs may say, these are the main things in an architectural composition, and that mere detail is altogether a secondary affair. However, at Cologne, the detail is anything but unworthy of the church. It has often been said to be a French cathedral on German soil, and there is very little of the German interlacing "stump tracery," which Mr. Fergusson used to dislike so much, while most of the cornices, gargoyles and other enriched exterior work would do no discredit to Paris or Amiens. That the sculpture about the doorways is cold, and too much subordinated to the architecture, is perhaps true, but the portals are so beautiful in their lines, and in the play of light on the carved mouldings, that one is easily reconciled to a little lack of originality or "phonetic" quality.

Inside, however, the lack of originality of the exterior is certainly made up by the happy idea of placing statues at the foot of the vaulting-shafts. The interiors of French cathedrals are generally uninteresting, as compared with the exterior, and the architect of Cologne, if he had been content with copying, might well have been satisfied with the elegance of proportion which he had succeeded in securing; but he seems to have felt the need of some movement and interest near the base of his piers, and, by placing his statues against them, he not only obtained an admirable richness and solidity of perspective effect just where all French cathedrals lack them, but added much, it seemed to me, to the lightness and apparent height of the ceiling. If he had used the statues with less discretion, as, for instance, at Milan, where they are plastered in lumps around the piers, they would have done more harm than good, and in the photographs of Cologne they appear at least of questionable value, but in the real building they are exactly right, just large enough and just high enough to give the effect desired.

ANCIENT AND MODERN LIGHT-HOUSES.[1]—II.

TOWER OF CORDOUAN.

PANEL ORNAMENT ON TOWER IN CATHEDRAL, AMIENS, FRANCE

IT is to Monsieur Belidor, Colonel of Infantry, Chevalier of the Military Order of St. Louis, etc., that we are indebted for the best description of the Tower of Cordouan. The following account is taken from his "*Architecture Hydraulique*," published in 1777, "with the approbation and privilege of the King." He says:

"Since the superb light-houses built by the ancients, there has not appeared one more august nor of more importance than the famous Tower of Cordouan, located on a rock in the sea at the mouth of the Gironde, to aid the entrance and exit of vessels in the two rivers, Garonne and Dordogne, whose confluence forms the Gironde. Without this tower many vessels would be wrecked. It serves as a beacon during the day and a light at night, to guide the ships, and to prevent them from running on the reefs, which are numerous in the vicinity. There are but two passes, the one called *le pas des anes*, between Saintonge and the tower of Cordouan, and the other between the same tower and Medoc, named *le pas de grane*, both equally dangerous.

"The tower is about two leagues from Bordeaux, and the rock on which it is built is 500 toises in length from north to south, and 250 toises in width from east to west. The sea, in its vicinity, is filled with sunken reefs, covered with three or four feet of water, against which the waves break with great fury, making the access to the tower extremely difficult.

"This magnificent tower, rising 169 feet above its base, was commenced in 1584, during the reign of Henry II, by Louis de Foix, a celebrated French architect, and finished under Henry IV, in 1610. Sailors deem this light-house the finest in Europe, not knowing any other more magnificent, or as bold in construction. As can be seen by the plan of the tower, there is a platform, surrounded by a circular wall, against which are the various buildings for the residence of the four keepers and for the storage of supplies; the latter contains six months' provisions, and there is a fine cistern for catching an ample supply of water from the tower. In the centre of the platform is the basement floor, containing a large room, two closets, and small room. Underneath are the cellars and the cistern. The first floor, which is called the King's Appartment, comprises a vestibule, closets, and other conveniences. The second story is occupied by a chapel, where mass was said when the weather permitted a priest to land. In this chapel were the busts of Louis XIV, and of Louis XV, placed there in 1735, with a grand Latin inscription containing a condensed history of the tower. There is also a bust of Louis de Foix, over which is the following inscription in a large frame:

"'Qvand iadmire ravi cest œvvre en mon covrage
Mon de Foix mon esprit est en estonnement,
Porte dans les pensers de mon intendement
Le gentil ingénievx de ce svperbe ovvrage
La il discovrt en lvy et dvn mvet langage
Te va lovant svbtil en ce point mesmement
Qve tv brides les flots dv grondevx element
Et dv mvtin Neptvn la tempeste et l'orage
O trois qvatre fois bienhevrevx ton esprit
De ce qv'au fronte dressé ce phare il entreprit
Povr se perpetver dans l'hevrevse mémoire
Tv t'er acqvis par là honnevr infini
Qvi ne finira point qve ce phare de gloire
Le monde finissant ne le rende finez.'

"A description is unnecessary of the beautiful architecture which forms the interior and exterior decoration, it being easy to judge of it from the section and elevation. I will only add that the arms of France are on the front of the first story, accompanied by two statues, one representing Mars with his ordinary attributes, the other a female figure holding a palm in one hand and a diadem in the other. Lower are two niches: in the right-hand one is the bust of Henry II, and in the other the bust of Henry IV. The portico is opposite the entrance to the platform; on the opposite side is the staircase, partly built in the thickness of the wall, and partly outside.

"For more than a century this tower was the admiration of all connoisseurs, but at length, the heat of the fire having injured the walls of the lantern, the Court, in 1717, ordered that it be demolished, to prevent its falling, and that the light be established below it, instead of repairing the damaged parts, and keeping the light at the same height. It was not long before it was seen what a mistake this was, for the lantern had no sooner been taken away than all the sailors complained that the light could not be seen at a distance of two leagues, as was formerly the case.

"Things were in this state when, in 1720, the tower passed from the jurisdiction of Rochelle to that of Bordeaux. Then the Count of Toulouse, Admiral of France, and Marshal Asfeld, Director of Fortifications, entrusted the reparation of the tower to Monsieur de Bitre, Engineer-in-Chief of Bordeaux, who sought the means of rëestablishing the light at its former height by a lantern which should not intercept the light to the same extent as the old one. He accomplished this by building an iron lantern, as shown in the plate. This was successfully placed in 1727. The brazier for burning the fuel held two hundred and twenty-five pounds of coal, which was lighted at sunset, and burned all night. The old brazier was too small. Oak wood was burned in it; the flame was large, but it had to be replenished every three hours. The height of the new lantern was greater than the old one, so that the tower was increased in height to 175 feet from its base to the weather-cock."

This elevation was not sufficient to enable mariners to see the light at a very great distance, so Teulère, Engineer-in-Chief of the district of Bordeaux, performed the difficult task of raising it, at the end of the last century. The height was increased to 197 feet above high tide, giving a great increase to the range, but marring its architectural beauty, as the absence of ornament in the modern part contrasts painfully with the elegance and richness of the work of the Renaissance. The first impression of the tower, however, is still very striking, rising as it does with such majesty and boldness from the bosom of the sea.

About thirty years ago, this light-house was completely renovated, many of the stones, worn by time, were replaced, and the carvings, which had become almost indistinguishable, were recut; it now contains in its lantern, in place of the old oak or coal fire, that nearly faultless piece of apparatus known as the Fresnel lens, by means of which all the light possible is utilized in strengthening the friendly beam.

[1] Continued from page 16, No. 550.

THE ILLUSTRATIONS.

Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

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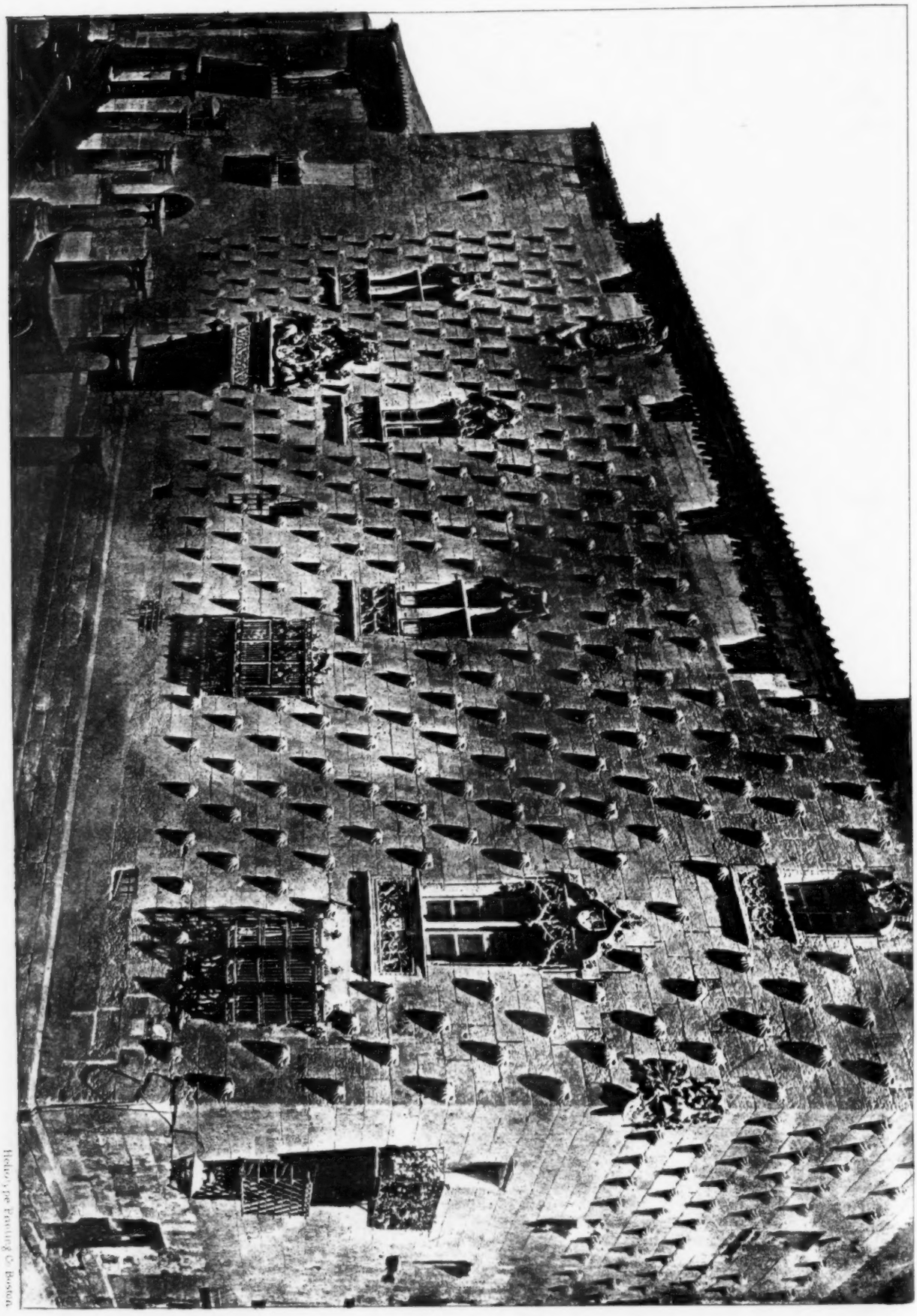

Casa de las Conchas, Salamanca, Spain.

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Sancti Spiritu

Sketches from

~SALAMAN

SPA

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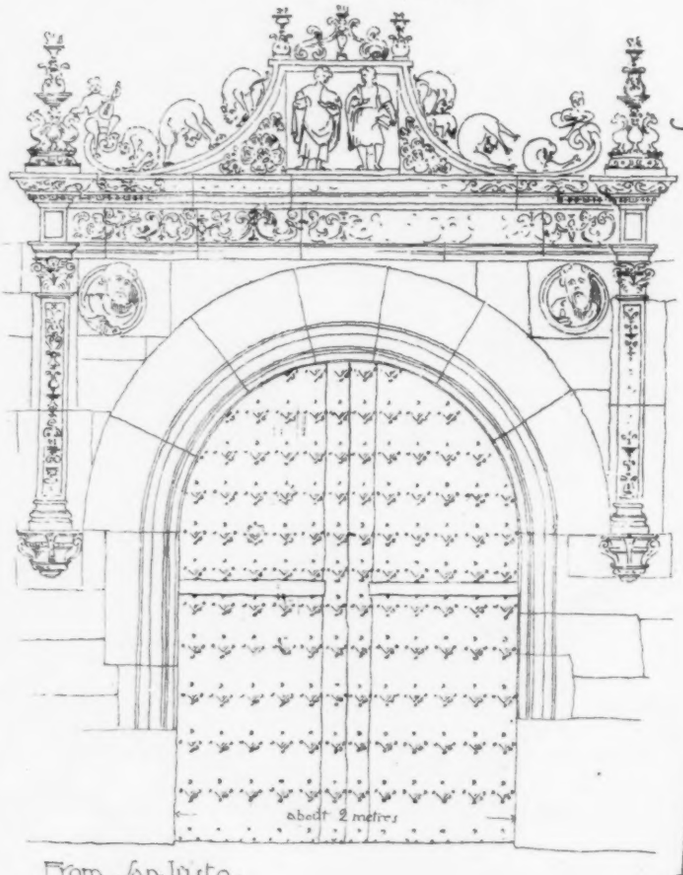

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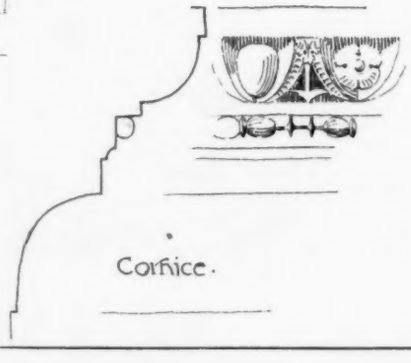

Cornice.

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The Cathedral.

MANCA—

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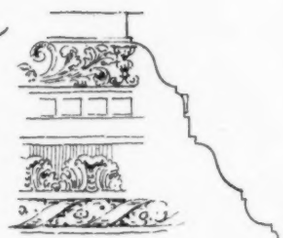
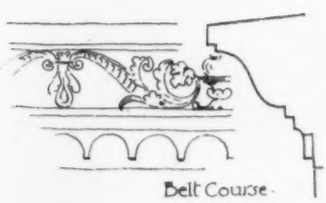
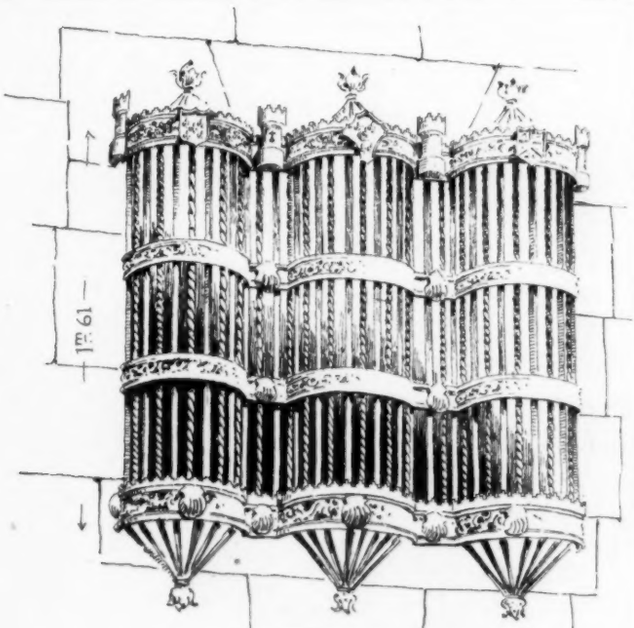


Cornice from the Instituto.

Details from the Casa de las Muertes.

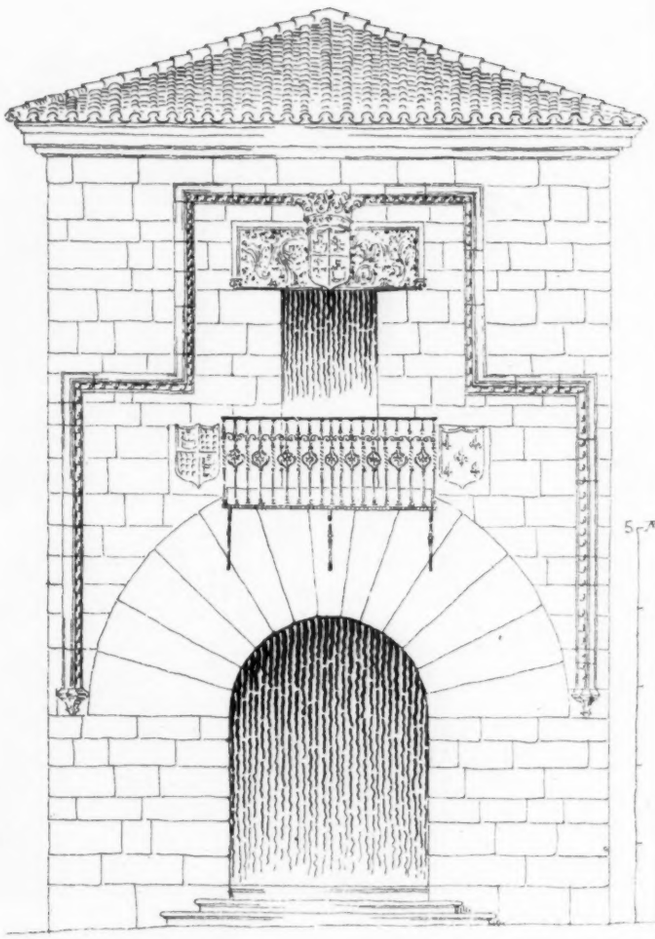


Belt Course.



Wrought Iron Grille—

Casa de Conchas—



Casa de Donna Maria la Brava.

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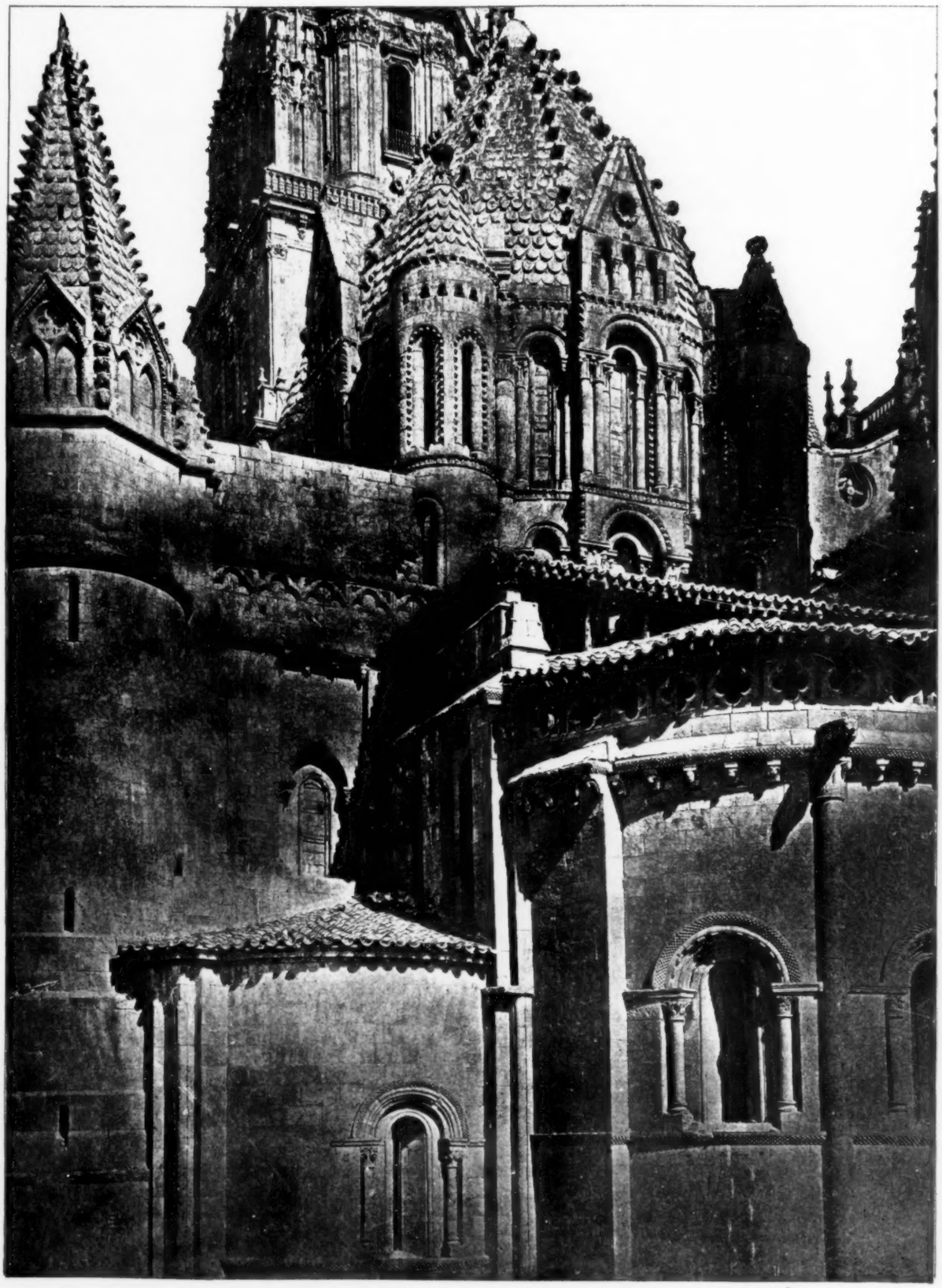

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The Cathedral, Salamanca, Spain.

Modern — Tower of Cordouan — Ancient

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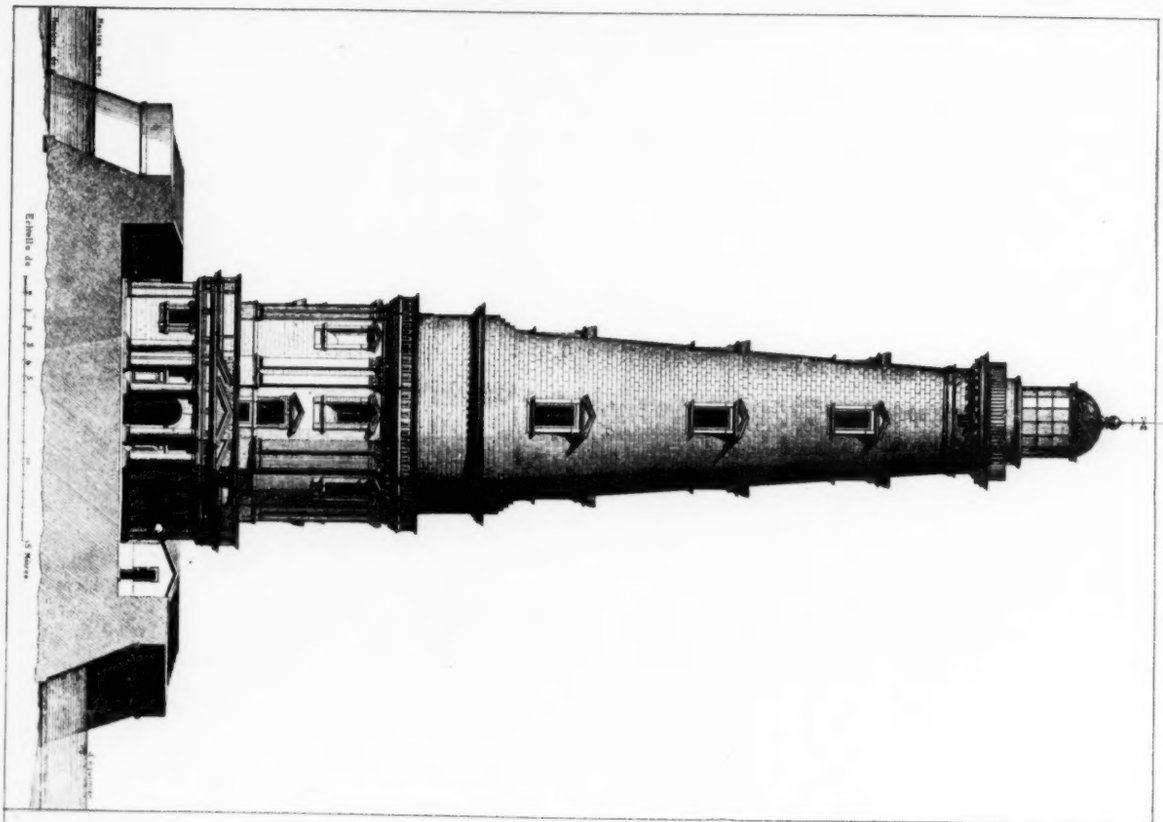

Modern — Tower of Cordouan — Ancient

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"THE ROCK." HOUSE OF DR. C. T. GARDNER, SAKONNET POINT, R. I. MESSRS. STONE, CARPENTER & WILLSON, ARCHITECTS, PROVIDENCE, R. I.

THE LIGHT-HOUSE OF CORDOUAN, FRANCE. ITS ANCIENT AND ITS PRESENT APPEARANCE.

FOR description see article on "Ancient and Modern Light-Houses."

SKETCHES AT SALAMANCA, SPAIN, BY MR. C. H. BLACKALL, ARCHITECT.

FOR description see "Notes of Travel," elsewhere in this issue.

THE CATHEDRAL TOWER, SALAMANCA, SPAIN.

THE CASA DE LAS CONCHAS, SALAMANCA, SPAIN.

EXPLORATIONS IN THE OHIO VALLEY.

THE valley of the Ohio River is one of the most prosperous sections of the United States, and when we speak of the marvelous development of our country, we are accustomed to point to this region as an example thereof; a region now teeming with a prosperous population, where, hardly more than a century ago, there was a wilderness, inhabited by only a few savage tribes. Yet there is evidence to show that there was a time in the unknown past, when the same land was peopled as densely as it is to-day, perhaps even more densely, if the great cities of to-day should not be taken into account. Not only is there evidence of the occupation of that great and bounteous valley by one people, but by various peoples, during the many centuries which have elapsed since the man of the glacial period lost his rude implements of flint in the glacial gravel. How many distinct epochs of occupation there have been it is yet hardly possible to say, though there appears to be a good prospect that much light will be thrown on the subject when the results of important investigations now in progress are determined, and opportunity is given to compare them and draw conclusions therefrom. It may be said, however, that upon one spot, a small district in the valley of the Little Miami River in Ohio, near the town of Madisonville, proofs of various distinct occupations have been found, showing at least three different peoples. The first of these carries us back thousands of years before the glacial period that covered the land north of the Ohio River with a vast sheet of ice, thick enough to cover the tops of many a high hill in New England. The proof of this is in chipped stone implements like those discovered by Dr. Abbott in the Trenton gravels in the Delaware Valley, and like others found in the Minnesota gravels of the Mississippi Valley, all of them of the same character as those brought to light in the river-drift deposits of Europe, and showing the antiquity of man on this continent to be as great as on the Eastern.

The investigations of this region have been conducted by Mr. F. W. Putnam, the curator of the Peabody Museum of American Archæology and Ethnology at Cambridge, and Dr. C. L. Metz, of Madisonville, Ohio, and they rank as the most important archæological exploration ever carried out in North America, being unapproached in thoroughness and scientific method. The usual way of conducting so-called explorations has been to dig at hap-hazard into a mound or any other spot, and take out whatever happened to be interesting. The things thus obtained, while valuable as "curiosities," lose much of their scientific worth from the fact that little is known of their surroundings. This slipshod custom has even been pursued by eminent scientific institutions which should have known better. The aim of Professor Putnam, with the earnest co-operation of Dr. Metz, has been to obtain the most exact data of the situation and circumstances, affording by the accuracy of the record of every stage of the work material for a complete history thereof. Therefore, when at any time the facts are to be inquired into there is nothing to be left to assumption or guess-work. First, there is a topographical survey made of the ground to be explored. It is then marked off into blocks and sections, and taken up section by section. A trench is dug across a section, through the leaf-mold down to the hard-pan, and the excavations then continued down to the same depth, keeping a uniform face-wall in front all the time, and throwing the earth behind, thus filling up again the space excavated as the work advances. In this way every inch of the earth in which remains of any kind are likely to be found is carefully examined.

When anything of importance is encountered, notes are made of its exact position, photographs are taken, and then the earth is carefully removed from around the object with a small trowel and a brush. If it be a mound which is being explored, it is sliced away vertically in the same way; accurate measurements are made of the sections at frequent intervals, scale-drawings are made and photographs are taken. Detailed memoranda are made of everything found, specimens of each kind of earth, stone, etc., are preserved, and the earth is carefully sifted wherever there are traces of anything, that not even minute objects may be lost. In short, nothing which by any possibility could throw light on the history of the subject of investigation is lost sight of.

An exceedingly interesting volume could be written about the results of these explorations already accomplished in Ohio. They began in 1881, but have been suspended at intervals on account of lack of funds. Professor Putnam had previously made some important explorations in the Cumberland Valley, in Tennessee; and his attention was drawn particularly to the Little Miami through the exceptional interest felt in the remains of the vicinity by a number of gentlemen in Madisonville of scientific tastes, among them Dr. C. L. Metz, who has been Professor Putnam's most valued assistant in this work, and has superintended it during his absence.

The first subject of exploration was an ancient cemetery, occupying fifteen acres or more of an extensive plateau, still covered in places with large trees of what is called the primeval forest. These trees, and the twelve to eighteen inches of leaf-mold overlying the hard-pan, showed that at least four hundred years must have elapsed since the burials took place. Over sixteen hundred skeletons have been found in this cemetery, generally from a depth of two or three feet, together with many implements and utensils.

A most remarkable feature of this spot, however, are the singular "ash pits," of which over a thousand were discovered. These were probably connected with the burials above them, but before these pits were made, the place had been used as a cemetery, as was shown by the finding of a number of the skeletons buried prior to digging the pits.

The purpose of the pits still seems to be a mystery, though several theories have been advanced. The pits are circular excavations in the hard-pan, three to four feet in diameter, and four to seven feet deep from the surface of the leaf-mold. The average pit was filled with ashes in more or less defined layers. Bones of fishes, reptiles, birds and mammals, shells and pieces of pottery, together with a large number of implements made of stone, and bones of deer and elk antlers were found. All the implements found here, or in the remains of any aboriginal American people, have their likes among the implements of primitive people in other parts of the world, with the single exception of one tool used by the people who dug these pits. This is made from the leg bone of a deer or some other large animal, longitudinally grooved, with sharp edges bevelled on the inside, and probably used as a scraper of some kind. Large numbers of these were found. Examination of several earth circles up the hill near the cemetery, forty-three to fifty-eight feet in diameter, shows them to be the sites of the dwellings of the people who made the pits, for the remains of utensils, etc., found there agreed with those in the pits. These dwellings were probably similar to the lodges of the Mandans and other Indians. Professor Putnam thinks that possibly on special occasions all the articles in the house, with ornaments, implements and other personal objects, were partially destroyed by fire, and the remnants gathered up with the ashes, and deposited in the pits dug for the purpose, while the broken bones, etc., indicate that feasts were held on such occasions. This might correspond, perhaps, with the custom of the Aztecs of destroying all their household utensils at the end of their fifty-two years' cycle, and beginning the new cycle with a fresh start.

The most remarkable and interesting results, however, have been obtained from the excavation of the earthworks known as the "Turner Group," in the northeastern part of Anderson Township, on the estate of Mr. Michael Turner. The group consists of thirteen mounds and two earth circles, the whole enclosed by two circular embankments connected by a graded way. This group is believed to be the work of the race that built the great earthworks in Ohio. Several of these mounds were called "altar mounds" from the fact of their covering "altars" or basins of burnt clay, two of which contained thousands of objects of rare archæological interest. These objects throw much light on the character of the people who built the mounds. The manner in which the mounds were constructed indicates that the population was large, and together with their contents, that the race was advanced to a stage of barbarism similar to that of the Pueblo Indians of the Southwest. They must have also been a people of considerable wealth, judging by the value and number of the articles they sacrificed upon the altars, while the extent of country from which these articles came, reaching from the Great Lakes to the Gulf of Mexico, and from the Atlantic Ocean to the Rocky Mountains, and perhaps beyond, gives evidence of the considerable commerce which they must have carried on. The greater number of the objects having been cast upon the fires were badly injured by the heat, and in many instances broken into small fragments, but some of the articles were preserved intact by getting covered by the ashes. Two of the altars, each about four feet square, were cut out and brought to the museum and the entire contents of two have been preserved, even to the ashes. The condition of the altar as it was found is, therefore, excellently illustrated: all the objects have been classified and arranged in separate drawers preparatory to final exhibition according to the admirable system which Professor Putman has devised for the museum. The smaller articles

were secured by thoroughly sifting the ashes and earth. One curious fact discovered was that this ancient people were acquainted with the properties of coal, some pieces of partially consumed bituminous coal having been found upon the altar. It is probable, however, that they did not get it by mining, but picked up pieces along the river from the outcroppings of the banks, as all the pieces are water-worn. The abundance of timber naturally made the use of coal needless.

Among the objects from the altars were found numerous ornaments and carvings unlike anything encountered before. This one altar contained about two bushels of various ornaments of stone, copper, shells, the canine teeth of bears and other animals, and over sixty thousand pearls. Nearly all these objects are perforated for suspension. The pearls are particularly interesting. They probably came from the fresh-water clams of the neighboring streams. Many were large and would still have much intrinsic value, had they not been injured by the fire. A few, however, wholly escaped injury. Ornaments of silver, copper and gold are made of native metal hammered out, there being no indications of smelting. Silver and gold were beaten out into thin sheets and folded over the copper ornaments, suggesting the rudiments of the art of plating. The silver and copper seem to have come from the neighborhood of Lake Superior and perhaps the gold came from Georgia. This is the first time native gold has been found in the mounds anywhere in this country, and the small quantity found here shows that its use was exceptional, but one small copper pendant seeming to have been covered with a thin sheet of gold, a portion of which still adhered, while other bits were found in the mass.

The most important discovery, however, was the several masses of meteoric iron and the ornaments made therefrom. This, containing nickel, was susceptible of a high polish, and was accordingly valued for ornamental purposes. This brilliancy would last as long as the iron was not exposed to moisture or to the great heat on the altar, causing it to oxidize. Several of the ornaments are covered with a thin plating of the iron after the manner in which the others were covered with silver. A number of objects of mica, cut out of large sheets, probably from North Carolina, were found thoroughly preserved. This mica was made into curious ornamental shapes.

Another highly interesting and valuable find from the altar of another mound of the group consisted of terra-cotta figurines and two elaborate dishes in the shape of animals carved out of a reddish slaty stone. These objects were badly burned, and broken and splintered by the heat. Some have been, however, by dint of remarkable patience and skill completely restored, and good progress has been made on others. Some of the figurines have something of an Egyptian type of face and bear also some resemblance to faces carved on ruins of Central America and Mexico, such as the Palenque cross. Their finish is of a higher character than most of the work of aboriginal races in this country. There is no reason to doubt that they were the work of the people who built this group of mounds and in some way, at least conventionally portrayed them, for the ear ornaments correspond with certain singular spool-shaped ornaments found on the altar previously mentioned. The figures show peculiar methods of wearing the hair and curious head-dresses. The dishes are elaborately and smoothly finished. One of them, in the shape of a fish, has certain conventionalized characteristics which are difficult to trace in any American fish. Whence arose this conventionalized form and what relation does it indicate? The conjecture might be hazarded that it is a type of ornament handed down by tradition from a time when the race lived in some other part of the world. The resemblance between certain American races, as shown by their art remains, and the Egyptians is in some particulars so near that many persons have formed a habit of tracing connections which are hardly warranted by facts so far as known. Still, no one can say there was not a connection and possibly it may be established some day.

A peculiar form of ceremonial is indicated by the fact that on the same altar, together with several hundred quartz pebbles from the river, there were nearly three hundred astragals of deer and elk, bones of which but two could be obtained from a single animal, and with them were but one or two fragments of other bones.

The most interesting of all the mounds of this group, and one of the most notable ever excavated, was constructed after what seems to have been an elaborate formula, a description of which would occupy more space than can here be given. In brief, it may be said to have been built over an altar, whose two layers of burnt clay showed that it had been used for a long time. Above this, the mound was composed of layers of burnt clay, sand, gravel and various kinds of earth, all respectively arranged in regular and even layers. Under the burned clay was a strange series of thirty-seven pits, about three feet in diameter and four to nine deep connected with tunnels or tubes eight feet long and a foot in diameter, having a slight dip downward from the pit, and ending in a small vertical tube extending to the layer of concrete or gravel above the burned clay. The walls of some of these pits showed great heat. What their use may have been can not yet be conjectured.

This is but a small portion of the work which has been accomplished in this region by Professor Putman, with an outlay of but a few thousand dollars subscribed by some friends of the museum, the institution having no fund large enough to enable the prosecution of such work. It is doubtful if another instance could be found of an archæological exploration conducted with such economy of means and with such splendid results. Professor Putnam has wisely decided to make the thorough exploration of the Ohio aboriginal remains his principal life-work, instead of making desultory excursions over the country at large. He has therefore marked off a field of labor occupying a space something like a quadrangle, extending north of the Ohio River, with its base on that stream extending from the Little Miami near Cincinnati eastward to Portsmouth.

This space includes many of the most important remains in Ohio, among them the famous "Fort Ancient," "Fort Hill," and the great "Serpent Mound." Professor Putnam is particularly solicitous that these magnificent monuments of the occupation of this continent by man unknown ages ago should be preserved and thinks the pride of the great State of Ohio in possessing these treasures of antiquity should be sufficient to induce the Legislature to make the small appropriation which would insure their preservation as long as our civilization might last. But as there seems little hope of that, could not this be secured and put under the perpetual care of the Peabody Museum, which is for the benefit of the whole country and not a local institution? Fort Ancient, particularly, is one of the great wonders of the world and scholarly tourists from Europe rank it with Niagara and the Mammoth Cave among the sights which they must see. It has a wall nearly five miles around and was evidently once a fortified town. Professor Putnam thus writes of a visit to it:

"Although it has withstood the elements for untold centuries, it is falling before the American farmer with his all-destroying plow, his herds of cattle and droves of swine. The immense embankments, from twelve to twenty feet in height, and sixty or more in width, are now gradually being undermined. Along their summits a fence has been built, by the side of which the cattle have worn a deep path, and from this, after every rain, flow hundreds of little rills, which are slowly but surely washing the earth from the top to the bottom of the steep banks. Here and there, also, a ditch has been cut to drain the fields inclosed, which every spring cuts deeper and deeper into the ancient walls. After fully appreciating the immensity of this structure, and realizing the enormous amount of human labor which was bestowed centuries ago upon these ancient walls and the mounds which they inclose, it was with a sigh that I turned away, feeling myself powerless to save so important a monument of the past for the wonder and admiration of future generations. It would require but a few thousand dollars to secure this grand old work, and with little expense the recently-destroyed portions could be restored and nature be induced again to furnish her protecting coat of verdure, and with slight care from coming generations, this achievement of an unknown people would be preserved for all time to come. If the museum should be the medium for accomplishing this desirable result, and Fort Ancient should be preserved and brought under its charge, it would, undoubtedly, be carrying out in the broadest sense one of the objects for which it was founded — the preservation of American antiquities."

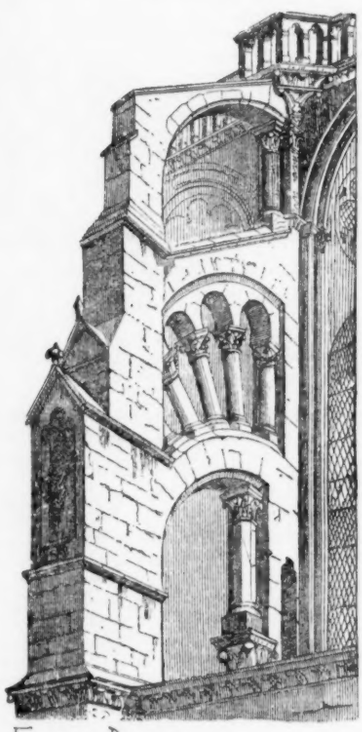
The museum has also been the means of bringing to light two other important facts relating to the remote past of man on this continent. Both of these are due to the explorations in Central America, conducted for the museum by Dr. Earl Flint, who made extensive collections for over six years in Nicaragua. There are now in the museum four imprints of human feet in volcanic rock, fourteen or fifteen feet below the bottom of the surface soil, about three hundred feet west from the present shore of Lake Managua. The foot-prints were immediately below a bed of clay and volcanic material containing fossil leaves, and over this are four distinct beds of volcanic material. The age of these imprints has not yet been determined, but they undoubtedly were made long before historic times.

Among the objects received from Dr. Flint were several fine ornaments of jadeite. One of these ornaments was a celt, or axe, elaborately carved, and others were smaller instruments, made of halves, thirds and quarters of celts, and perforated at one end for suspension. This cutting of celts was discovered by Professor Putnam, who, on examining them, found a portion of the cutting edge of the celt remaining on each piece. Two of the specimens fit together to make half a celt, which had been perforated in the centre of the upper end. When this half celt was again cut, a portion of the original perforation was left on each piece. Now there is no locality known on this continent where the jadeite has been found. If the material had been obtained from a locality within easy reach of the ancient people of Central America, says Professor Putnam, it would not have been considered so valuable, and they would not have spent so much time and labor in cutting up useful and highly-polished implements if they could have obtained the stone in the rough. Moreover, the stone of the Central American specimens has been analyzed by Mr. Oliver W. Huntington, instructor in mineralogy in Harvard University, who pronounced them to be unquestionably Chinese jade, having all the characters of that mineral. This, then, is excellent evidence of there having been intercourse between the people of Central America and those of Asia, probably in very ancient times, and Professor Putnam is of the opinion that the stone may have been brought to this country in the shape of implements by early invaders from Asia, and that, as the supply was not kept up, and most likely even its source became unknown, the pieces among the people were cut and recut and preserved as sacred relics of the past, to be, one after the other, finally buried with their owners. Therefore, this seems to be one of the most important facts yet known, tending to show that the implements were brought from Asia by their original possessors, and that at least one portion of America was settled from that continent.

It is desired now to obtain by subscription the means which will enable this work of exploration in the Ohio Valley to be prosecuted

this season, and to be continued after on a systematic plan for several years to come. It is also hoped, at the forthcoming two hundred and fiftieth anniversary of Harvard University, of which the Peabody Museum is a part, when efforts are to be made to secure handsome endowments for departments that need them, that the wants of the museum will not be forgotten, and that it will be afforded the means to carry out the work of archæological exploration for which it is so admirably fitted, and worthily to house and care for the collections it may obtain. Now is the time for archæological work in America, and splendid opportunities for the securing of priceless results are rapidly passing away. American efforts at excavations in the Old World have an amateurish aspect; Europe is caring amply for that work, and American soil offers a grand field for American endeavor.—*Boston Herald.*

UNDISCOVERED BOHEMIA.



FLYING BUTTRESS. CHARTRES CATHEDRAL.

THE desire of travellers, as distinguished from tourists, to find some spots beyond the sound of the tramp of autumn tripper, has not yet led even this class of European wanderers to penetrate into the fascinating circle of plateaux that are overshadowed by the Iser and Giant Mountains, and the Lusatian Hills. Here the inns are all still of the class where the traveller may take his ease, nor dread the onslaught to be made upon his pockets. Humble and unsophisticated ease it may be, but the ease that is so delightful after a mountain trudge amidst strange forms of rocks, that hold one entranced by their curious and picturesque groups, or after a climb to some robber's nest perched high up on some isolated mountain peak. No Oberkellner troubles you with eye-to-tip civilities. Mine host or hostess welcomes you as you enter, and if the rooms be but sparsely furnished, they are clean (except in the purely Cech towns), and the mountain air is as invigorating as that of the lower Alps. The especial district referred to at present is crossed by no railways, but has been encircled by them of late years; yet still the district, with all its inviting treasures for the naturalist, or the historian or archæologist, remains unvisited by the Englishman.

This narrow district is entirely shut in by mountains, with the exception of the open plain that stretches southwards and Pragwards; and in this direction solitary peaks start up that acted in the Middle Ages as sentinels over this fertile plain that led to the capital. At most of the larger towns a carriage and a good pair of horses can be obtained at a very reasonable rate; but the distance from each separate point of interest is within the pedestrian's reach, and when the traveller has ascended one peak he will quickly find that the whole district teems with interest, and if he is to be moved by any of the objects that usually delight travellers, he may even be moved to excitement at the prospect stretched before him.

The mountain peaks here are not as other mountain peaks. Unlike the heights in the Rhine district, they tempt one to the ascent, not simply from the fact that a glorious view is to be obtained from their summits, but also by their own peculiar formation. Like the hills and mountains in Saxon Switzerland, the forms they have assumed surprise and astonish; and as the dark lower pine forests at their bases are entered, the solitary giant pillars of grey and yellow sandstone oftentimes spring up on every hand, and detain the traveller as he climbs the height, to wonder at their fantastic formation. Here and there entrances are seen into the mountain side, and great caves may be explored that formed the peasants' stronghold in the days of "Fist-right."

It is not often necessary to take a guide through these solitudes. Of course there are no guides such as the Swiss tourist would understand, though a boy may be found perhaps at the nearest cluster of houses who, for a few kreutzers, will show the nearest cut to the top of the mountain; but the mountains being isolated, generally the widest ascending wood-cutter's path leads to the summit; and, frequently as the forest is entered, the most picturesque wood-cutter groups may be seen encamped where their work of cutting and stacking, and branching the lesser timber detains them.

The peasant women throughout the district wear at all times the brightest colors, so that these groups often contain women forms dressed in light pink, blue, grey, primrose and other colors dotted about amidst the stacks of newly-cut timber. A rough hut of logs perhaps has been erected for their shelter, at the door of which streams up the pillar of blue smoke from the fire that warms the coffee of these poor toilers, whose pay perchance amounts to three or four shillings per week. As the hill is ascended, sometimes little knots of three or four wood-cutters are met bearing or sledging their stacks of timber; one man perhaps is with them, and two or three women, each dressed in a different but bright-colored dress, and wearing on their heads handkerchiefs of still more brilliant hues. These groups suddenly appearing amidst the unending vista of the pine trunks, have a most striking and even theatrical effect; and perhaps just as the traveller is beginning to wonder when he will reach the summit, or at least see some traces of the castle whose ruins he has been told still top the height, he will be confronted on this silent, narrow forest path by some great mass of masonry that is the first glimpse of the fortress, the greatest part of which lies cunningly hid amidst the rock, and which now is so overshadowed by the pines that no glimpse of it can be obtained until one stands amidst its walls.

But frequently the first sign that the summit of the mountain is being neared, ere yet the light can be seen breaking above through the on-stretching aisles of pines, are the columns of basalt that pierce the sandstone and screes, and tell of what the core of the mountain is built.

The whole district is volcanic, and basalt and porphyry and granite combine with the sandstone to form the strange and fantastic shapes that the mountains and rocks have assumed. The heights of the mountains vary from one to three thousand feet; but for those who long for higher altitudes, in the near distance are the Giant Mountains, with heights ranging from five thousand to six thousand feet, and where the white glitter of snow is rarely absent.

The castles that crown the caps of these masses of porphyry, or columns of basalt, form the greatest charm of this district. Each one (and they may be reckoned by the dozen) has its own peculiar character. Its development is marked through the ages of Fist-right and of Priest-right, or of Kaiser-right; and cunningly devised means of defence, or devilish suggestions of horrid torture, or traces of past regal splendor, or of churchly munificence or cruelty, all now unveil themselves to the eye of the curious traveller until he halts and lingers, and dreams over these yet well-preserved proofs of how terrible a history Bohemia has endured and survived. Three typical castles within this mountain circle are the ruined fortresses of Burgstein, Bösig and Oybin, each entirely different from the other in situation and in formation. The first lies in a flat plain, the second caps imperially an open height, the third is also upon a mountain height, but is hid amidst the natural towers and bastions of sandstone that also form a part of its walls.

Burgstein is perhaps unique in Europe, for no masonry is used in its structure. Simply an isolated mass of sandstone lying in a flat meadow, some short distance from the mountains, has been scooped out and formed into a powerful fortress, with halls and armories, banqueting and dwelling rooms, and stables, chapels and dungeons, and, as in all these Bohemian castles, the inevitable horror of a hunger tower. The soft sandstone of the inner walls of this tower now open to the light of day, are scored with the marks of the wretched prisoners who had been hurled or let down into its depths to die slowly of hunger and broken limbs or wounds.

If Burgstein has no architecture, and was but merely a robber knight's stronghold, with a short but stirring history, Bösig can boast of imposing architecture. Robber, knight, and emperor and Church, have all added to the glories of Bösig; and the mighty towers and embattlements that yet rear themselves up proudly on the mass of porphyry that forms its foundation seem yet to breathe of its past splendor and glories; whilst the beautiful little chapel that overlooks the eastern precipice of the mountain speaks of the struggles for priestly supremacy that tore and ravaged this district until human flesh was not safe from the teeth of starving, dying, maddened men.

The third castle mentioned, the Oybin, is totally different from the others both in architecture and situation. It has a strange charm and beauty of its own, and the forest pines that cling around, and hide and overshadow its walls give a solemn calm to its cloisters and chapel and tiny precipice-clinging God's-acre. And they add now to the secrecy of the castle, for they hide entirely the earliest embankments and masonry that surround the extreme summit of the mountain, and overtop the later and greater castle and chapel.

In a short *résumé* of the sights and scenes of this district there is not space to describe fully either the castles or their history; but the latter is generally far more romantic, and sensational, and murderous, and horrible than the most blood-thirsty of "shilling-thriller" writers would dare to invent. And after living for a time in these mountain-tops, amidst dungeons, and halls, and cloisters, and the never-omitted hunger towers, it is like leaping onward some centuries to descend again into the meadow lands, and see the peasants working peacefully in the fields. They often work in long lines of twenty to thirty, perhaps one or two men, and the rest women; and as the women are dressed in every imaginable color, and each with a different colored headdress, the effect against the brown arable or green pasture is singularly striking and "operatic." Frequently upon the roads the

characters met with are almost alarming in their Bohemian wildness. They have great jack-boots and short jackets, long, black wavy hair, and high slouched hats, with a sort of leather sabretache slung across the shoulders, the leather being nearly hid with little brass plaques that appear to be highly useless but ornamental. These characters are generally extremely dirty, and speak only Cech, whilst another peculiar and rather wild-looking person frequently met is the Moravian pedlar, who wears a white felt hat with black embroidery, a long white coat also laced and embroidered, short baggy breeches, formerly white, with scroll designs worked down the side, and like the Cech, great jack-boots. These men are often large buyers of the Bohemian glass and pottery, which they take down the Danube and sell in the remote districts of Hungary and Transylvania, and although their dress gives them a strangely romantic appearance, yet both Cech and Moravian give one "good day" in a pleasant and civil manner.

The services in the churches are often a rich treat both for eye and ear. The women who crowd the church with their brilliant head-dresses, now of silk instead of cotton or woollen, give vivid color to the scene, and the organ, assisted by a good string band, and frequently an excellent choir, interprets well the music of the mass. At their funerals also they always have a band that plays a wailing, weird air in front of perhaps (even for an ordinary funeral) some hundreds of people; for all who have the spare time join in the procession, which is often very curious in its composition. On each side of the coffin women bear lighted torches, and as the long procession winds up some hill, the strange effects of color in the crowd, and the plaintive notes of the slow march arising from it have a most striking effect.

But their fondness for funerals does not prevent them going heartily into what is generally accepted as *la vie de Bohême*, dancing and music and theatre. Every little village has its theatre; perhaps simply the large room in the principal inn, where strolling companies play very frequently; and veritably they are indeed "poor players," for perhaps the star on a benefit night, even in a fair-sized town, will gain but two or three gulden for his share of the spoil. And after the play is over, and "Baron" and "Count" descend from the little boards that rattle and shake with every step of the actor, and even tremble beneath the lighter pressure of the foot of "Baroness" or "Mädel," the scenes in *Wilhelm Meister* are before one, and "Phyline," and "Melina," "Luertes," and the Herr Director may all be seen seated amid the crowd of beer and coffee drinkers, who are discussing vigorously the qualities of the plays and players. The "prompter" has no slight part in these Bohemian theatres, for he repeats in a very audible husky tone every word of the play, just a line or two in advance of the actor; and if one has been rash enough to pay for a best seat, amounting to even the sum of seven pence, it is most worrying to hear in a hoarse whisper from the prompter the tragic line, or the funny joke, that a second or two afterwards issues with appropriate action from the lips of the "Baron" or "Hausknecht."

But the Bohemians enjoy their little theatres, and in every village are well posted also the announcements of probably two or three "Tanz-Musik" evenings in various inns. Far into morning they will dance, and yet appear at their daily labor when the hour of six strikes. Fairs and markets are frequent, and the whole neighborhood is swarming with busy, active, and even jovial life, in spite of the (to English eyes) ridiculously small amount of money that constitutes the daily wage of most of the dwellers in this district.—*Saturday Review.*

THE IRON PILLAR OF DELHI.

DURING my sojourn in Delhi I visited and inspected carefully the Loha-ki-Lat, or the Iron Pillar, as it is known universally to the natives and English residents of India respectively.

This celebrated object is situated in the midst of the Masjid Jama, Masjid-Kuv-vat-ul-islam, an ancient (Muhammadan) mosque, now in ruin, which is believed by archæologists to occupy the site of a still more ancient (Hindu) temple of Rai Pithora, or Prithiraj, (the son of Someswara, and grand-son of Visala Deo, the Chohan conqueror of Delhi,) who reigned during the last decades of the twelfth century. Accordingly, it is in the midst of the Qil'ah Rai Pithora, or the citadel built by this monarch, the last of the Hindus to rule in Northern India, in the midst of several of the thirteen capital cities which in succession have appeared and disappeared in the course of time within the forty-five square miles of comparative waste around the modern city of Delhi, and which collectively compose the Rome of Asia; and it constitutes thereby one of the historic hubs about which the associations of mankind have revolved for ages in the past and will revolve for ages yet to come. It is a monument of antiquity involving humanity that has few rivals; one of which, I may remark incidentally, is within a cable-length or so of it, the Qutb Minar, a tapering, balconied and elaborately inscribed and ornamented shaft of fine red sandstone and marble, two hundred and thirty-four feet in height, generally regarded as the special glory of Delhi, as the Taj Mahal is of Agra.

As it appears to the eye, the Iron Pillar is a polished and inscribed, cylindrical and tapering shaft of metal, surmounted with a capital which consists of a series of bevelled rims one above the other; and, as it has been found to be by measurement, it has a total height of twenty-three feet, eight inches, about twenty-two feet, six inches of which are above the ground and fourteen inches below, and a diameter below of 16.4 inches, and above of 12.05 inches. The capital is about three and one-half feet long, and the base, imbedded in the platform from which the monument rises, is said to be "an irregular knob in shape, resting on several little bits of bar-iron, let into the stone underneath, and secured with lead." It is of undoubted antiquity — from one to two thousand years old. From which statement it may be inferred that the archæologists who have made it a special study have not determined its age with unanimity. Indeed, the archæologists, chemists, linguists and other men of science differ so much in their determinations with respect to this celebrated pillar that, doubtless, it will be regarded soon as a stupendous apple or bone of contention, constructed and set up by a misanthropic monarch of old in mockery of the assumptions of science in his own and succeeding ages!

The date of the building of either the mosque or temple has nothing to do with the date of the construction of the pillar. Moreover, the size of the pillar is not such as to make its removal from one place to another an impossibility, or even a task involving any extraordinary difficulty. It is found to-day as indicated above; but when or where it was made are matters beyond the significance of its surroundings.

With respect to its material, which is a matter of great importance in determining the value of the monument as a mile-stone in the march of man, the majority of the travellers and others who have written about it describe it as "mixed metal," "bronze," and "composition." Jacquemont calls it "soft iron." Dr. Murray Thompson, after analyzing it, says it is "pure malleable iron, of 7.65 specific gravity." Carr Stephen asserts that it is "wrought iron;" and Dr. Bhau Daji persists in his statement that "iron forms no portion of the monument whatsoever, and that it is a compound of several metals." In learning which, gentle reader, you, doubtless, will come to the conclusion of my worthy friend, Mr. William R. Jones, the General Superintendent of the Edgar Thomson Steel Works, that chemistry was invented by Ananias, for, otherwise, the contradictory statements and analyses of chemists are unaccountable. After which I may venture an opinion of my own — not being a chemist.

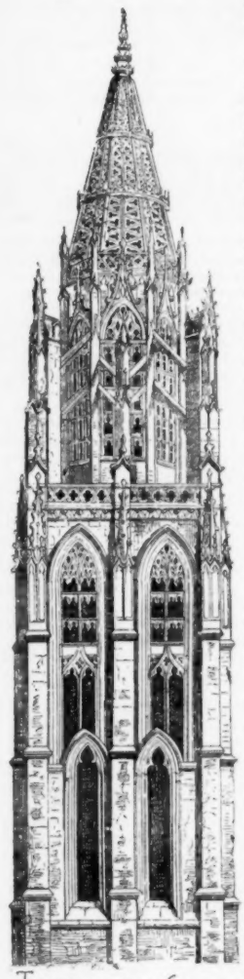
When iron in any known form (unless protected by the new process of Professor Barff, of London) is exposed to the atmosphere it becomes oxidized or rusts. Now the pillar in question, albeit exposed to the atmosphere for a thousand years or more, is not only not rusted, but the lines of the inscriptions with which it is covered are as sharp and distinct as if engraven but a month or so since. Argal (to use the corruption of the grave-digger in Hamlet for ergo), the Iron Pillar of Delhi is not iron at all!

But what is it? When doctors differ, as is their wont, I decide for myself, as is my wont, leaving others to do the same, from the best information at hand. The material of the monument is a kind of bronze, and the monument as such is remarkable only for its massive size as a relic of the Bronze Age of Man, and not, as commonly regarded, as a prophetic prodigy of the Age of Iron; and, moreover, from the evidences offered by its appearance on close inspection, I believe it to have been cast and shaped in a very simple manner, to wit, with the common blowpipe and such planes and chisels as the metallurgists of India possess to-day, as, doubtless, they have possessed for ages past. Bit by bit the bronze has been fused by the blow-pipe and welded together into balls or other more or less regular masses. These balls, then, have been laid in a trough and welded together in the same manner by the patient workmen, bit by bit and part by part, until the whole assumed the form of a rough, cylindrical and tapering mass, with a crude capital at one end. The rough shaft then was planed and polished, and inscribed and set up; its construction not involving a greater amount of metallurgical knowledge and skill than that possessed by the Indian workers in bronze of the present day. In proof of this having been the process by which the monument has been constructed, it presents in the mottled appearance of its polished surface, and in the lines and swirls and twists to be observed here and there, the same evidences which I have noted in a polished pump-handle made forty or fifty years ago by a rural blacksmith in Western Pennsylvania — every bit of old or waste iron of which the long and curved lever was composed by welding being apparent in it after it became smooth and bright in constant use.

And now, in conclusion, a word with respect to the inscriptions on this celebrated monument of antiquity. As the chemists are not agreed as to its composition, so the linguists, with respect to the writings which at various times have been engraved upon it. Some

time ago Mr. Prinsep translated the oldest of these inscriptions into English, and the world wondered; recently Dr. Bhau Daji translated the same into English too, and the world blundered — that is, the differences between these two learned men are so great as to indicate an error in one or the other egregious enough to have the effect of a universal blunder. — *Frank Cowan in The Bulletin.*

CORNICE AND DEMOLITION ACCIDENTS.



TOWER OF THE CHURCH AT CAUDEBEC, FRANCE.

THE "arch," according to an Eastern proverb, "never sleeps"; it is always exercising an active wedge-like influence, and, therefore, silently doing its work of destruction. In many a ruin of a Gothic monastery the fragments of arches and the solitary arch still spanning the deserted nave, as we see in the tower arches of Tintern and Fountains Abbeys, appear to contradict this assertion, but they do so simply by virtue of the power of cohesion of the cement which binds the stones together. What is thus true of the arch is to some extent true also of the cornice. It never sleeps, but is always actively engaged in obedience to the law of gravitation and by its own weight, in exerting a lever-like power to overthrow all that is above it. These two active agents of destruction have ever been a source of trouble to the architects of all ages. In Italy many a beautiful structure is spoiled by the iron ties and bands which are introduced to counteract the first, and the bolts and other means taken to prevent the tilting of large and weighty cornices. In India and other Eastern countries subject to the shock of earthquakes, both these features have a bad reputation; and they have, therefore, been generally discarded, or introduced only under certain safeguards. Even in this country, under strict building-rules and the vigilance of surveyors, they now and then give trouble. Not many weeks ago a massive stone cornice, forty-eight feet in length, on the west side of Cannon Street Congregational Chapel, Preston, fell, one morning, and utterly destroyed a portico of the school in the basement area, but fortunately injured no one. A similar accident, though happily unattended with fatal consequences, occurred August 5 in the Savoy. The work at the new Medical Examination Hall of the Royal College of Physicians and Surgeons, which is favorably progressing, had arrived at the cornice level, and the workmen had placed the stones of the cornice *in situ* along the western side, and had strutted them at intervals before proceeding to lay the blocking-course over, when the whole cornice gave way without the slightest warning. The scaffolding, which was erected against the same side of the building, gave way under the blow like matchwood, and presented the appearance of a twisted bundle of broken sticks. Luckily none of the men were injured; they possibly, if accounts be true, had time to get within the building through the window openings. The stonework was of massive character, and must have weighed many tons. It was plainly moulded, and, from the section we have seen, the "over sailing" was small, not exceeding in projection from face more than two feet, with a good bed-mould beneath the cornice. Provision has been made in the details and specification for connecting the stones by cramps; they run through the whole thickness of wall, and every precaution was provided so as to prevent accident. The design of the architect shows a parapet nine feet in height above the cornice, and measuring in thickness eighteen inches for several courses, and then fourteen inches to the coping — a mass of brickwork capable of holding down a cornice of two or three times the projection, to say nothing of the iron roof, which is intended to rest upon it. But, as in all accidents of this kind, it was before this counterpoise had been built, and during the process of placing and temporarily supporting the cornice, that the fall took place. Struts at intervals were provided, abutting against a stone string-course some feet lower down. We allude to the circumstance here simply to draw the attention of builders and masons to the great need at this stage of building of providing against casualties of this nature. The ordinary course is to strut up the stones from the wall below, as was done here, but we have even heard of the scaffolding being made to support the cornice at this juncture. A safer plan is to provide a temporary staging of planks and struts to take the projecting part of the corona of the cornice, taking care that the weight be thrown upon the walls. The Metropolitan Building Act is almost silent upon the point. Section 26 provides that every cornice is to be of some fire-proof material; but no very clear or distinct rule is given. Only in detached and semi-detached dwelling-houses, distant at least fifteen feet from any other building and from the ground of an adjoining owner, is the above rule relaxed, a condition which, of course, implies a building surrounded to that extent by its own ground. The Act allows a builder to corbel out a chimney stack above a certain height to the full thickness of the wall, and a similar rule might not be unsafe when applied to cornices, though the conditions of the two structures differ. In a corbelled chimney the bond increases in strength as the work is carried up in height, and it is only practically the lower courses that bear on the corbel, or stone, inserted at the commencement. In the cornice the weight of the projecting portion must be counteracted by sufficient weight behind, as there is no upper bond to assist. A corbelled stack does not overhang its whole weight like a cornice, and when the bond is good and the mortar is good it has no overturning power for mischief when the walls are well tied in. The chief dangers in the cornice are during its construction in crowded streets, in the want of sufficient counterweight or parapet when finished, and imperfect dowelling of the stones. For a heavy and very projecting cornice a wrought-iron band placed along the upper courses of cornice, tied down at intervals by iron ties to the brickwork or to the beams of a floor, is the proper means of securing its safety. Many fatal accidents have taken place through the fall of cornices in streets. Only a few years ago a heavy cornice in Fenchurch Street fell, and killed a gentleman; and we well remember a fatal accident in Wood Street, and another in Great Winchester Street, both from falling cornices. Another danger is owing to the improper construction of cornices, and the falling of portions of the stone from the effects of frost. Some years ago a man was accidentally killed at Ipswich from the fall of a stone from the cornice of the town-hall, weighing ¼ cwt. Frost had acted upon a piece of the stone and had loosened its hold upon the adjacent stones. By a proper system of cramping the stones at the back, or by dowels of copper, slate, or galvanized-iron, such an untoward accident as the falling of fragments might be prevented. The dowels should be introduced between the stones which overhang. There is great care to be exercised, however, to prevent the metal becoming a source of weakness to the stone. Cramps, if not properly run with lead or cement, may create the very mischief sought to be avoided, by leaving crevices for the water to lodge and congeal, and certainly dowelling is the safer mode.

The other day some excitement was caused by the fall of a house at the corner of High Street, Bloomsbury, and Oxford Street, facing the Horseshoe Hotel. The fall was due to the partial demolition of the houses at this spot, under the Street Improvement scheme. Three men, at least, amongst those who were buried in the ruins, sustained serious injuries. Unexpected falls of this kind are almost impossible to be averted. But are they always to be classed under the category of accidental? Often carelessness, or a fool-hardiness on the part of the men engaged, is the immediate cause. Stricter care seems, moreover, necessary during the stage of demolition than appears to be generally bestowed by the authorities. Many of the old houses "hang together" rather than are upheld by their own foundations, and when one is removed, which has acted as a sort of wedge, the adjacent houses yield and collapse. Corner houses are generally very "risky" buildings, and their shorings ought to be undertaken before any demolition is commenced. Any one would imagine it would be safer to commence at the corner, and proceed slowly with the adjoining houses; but, of course, every case must be law to itself. One rule which must always be a safe one to follow in demolition, as in building, ought to be observed, though we see every day instances where it is not followed. We mean the simultaneous pulling down of a whole row of houses. The difficulty, no doubt, is to get a sufficient number of hands to undertake the work at once, in cases where a whole line of one side of a street has to be demolished for improvements. Often the leases fall in by degrees, and only one or two properties are acquired at a time; but under the larger scope of the Metropolitan Street Improvement Acts it becomes possible to take in hand a large area at once, and when that is possible an immense amount of shoring and risk may be saved by a gradual taking down or removal of the whole of the buildings simultaneously. Nearly all the accidents we hear of are owing to the partial demolition and want of shoring.— *Building News.*

NOTES AND CLIPPINGS

CREMATIONS AT PERE LA CHAISE. — Next month the Parisians will be able to burn their dead in four crematory furnaces, which have just been finished at Père La Chaise. These furnaces were begun last November, and have been hurried on to completion, so that by the end of August at latest those who, in dying, express the wish to be cremated, can be there reduced to ashes. There will be no first, second, or third class cremations. Poor and rich will be on a footing of absolute equality. The price charged to those who can afford to pay for the burning of a corpse will be 15f.— or, say, 12s. The furnaces were constructed on plans by MM. Barrett and Formice. A large portico is in front of a dome, beneath which are placed the crematory furnaces. They have the appearance of very elegant ovens. Three hundred and fifty thous.

and francs was the price they cost. They are, according to the Corini system, in use in Rome and Milan. It was found that the heat of the Siemens furnace was too intense. Instead of reducing the corpse to ashes, it subjected it to a kind of vitrification. The cost, too, would be 200f., instead of 15f., to cremate with a Siemens furnace. The unclaimed bodies at the hospitals which are not used for anatomical purposes will be taken to the crematory at Père La Chaise. Sculptors, goldsmiths, and bronze casters are already busy designing urns, of which an assortment in marble, bronze, gold, silver, zinc, or lead will be kept at an office of the crematory. The relatives of the cremated dead can buy these vessels, and cause them to be removed to family vaults, or to a building which the City of Paris is to erect. There could be no greater boon to a large city with overcrowded cemeteries than the furnaces of Père La Chaise. I cannot conceive anything more disrespectful to the dead than the way their remains are treated here, even when a first-class burial can be provided, if there is not a family vault in which to place them. Buying a grave is no simple matter. The delays are endless, and the application for one must go through many bureaus before official consent is given. Then there are other formalities to be gone through. Meanwhile the corpse is in a charnel house, called a provisional vault, at a cost of one franc a day, The removal thence to the grave, which must be in masonry at the sides, is a cause of danger to the public health.— *London Daily News.*

A Carved Wine Cask. — There was finished and exhibited in Mayence recently a richly-carved wine cask, capable of containing upwards of six hundred litres, entirely made from the wood of the old Roman bridge, built under the Roman emperors Trajan and Maximian, and discovered and taken from the Rhine in 1880. Of the wood still remaining, more casks of rather smaller dimensions are to be sent to the United States.— *Exchange.*

The Internal Temperature of the Earth.— The London *Times*, referring to the deep shaft being sunk near Schladebach by the German Government, with the special object of obtaining reliable data concerning the rate of the earth's increased temperature toward the interior, concludes, from all that has thus far been developed, that the earth's crust cannot be more than about one-ninetieth of its radius. It seems that the plan pursued has been to ascertain the temperature at successive stages by means of a special thermometer, the principle of construction being that, as the heat increases, the mercury will expand so as to flow over the lip of an open tube, the difference of the overflowing giving the rate of increase of the temperature. At the depth of 1,392 metres the temperature indicated 49° centigrade, or 120 Fahrenheit. If the temperature increases regularly at this rate, the boiling point of water ought to be reached at a depth of 3,000 metres, or nearly two miles, and at forty-five miles the heat would be that at which platinum melts.

The Castle of Chillon.— "There are ruins so precious that it becomes us to arrest their decrepitude, and by dint of pious restoration to constrain them to live." Thus wrote Rousseau about the castle of Chillon, that cherished possession of the Canton de Vaud. The ancient fortress, built upon a rocky ledge which juts out into the lake of Geneva, is as well known to travelled Englishmen as Tintern Abbey or Haddon Hall to their stay-at-home compatriots, and has a story as romantic as that attaching to "the castled crag of Drachenfels" or to any other historical ruin upon the Rhine. Says the London *Telegraph*: Nearly seven centuries after the foundations of the first castle erected upon that spot were laid in the rock which carried and supported the structure, two great writers—one of them English and the other French —connected Chillon in the first case with a poem and in the second with a romance, which will neither of them die. "*The Prisoner of Chillon*" is at least as popular and as widely known as any of Lord Byron's shorter poems, while Rousseau's "*Nouvelle Héloïse*" was held by George Eliot to be unsurpassable for beauty. Lord Bryon tells his friend and correspondent, Thomas Moore, that when he wrote "*The Prisoner of Chillon*" he knew next to nothing about Bonnivard, the hero of his tale. "When this poem was composed," writes Lord Byron, "I was not sufficiently acquainted with the history of François de Bonnivard, or I should have endeavored to dignify the subject by an attempt to celebrate his virtues and courage." It is, perhaps, more to the purpose, as an evidence of the aimlessness and waywardness of Byron's erratic genius, to know that "*The Prisoner of Chillon*" — which was composed in a day and a night at a little inn or cabaret at the village of Ouchy, the lake port of Lausanne — would never have been written had not its noble author been detained there in the June of 1816 by stormy weather. Such was the facility with which Byron wrote, and so fertile the harvest produced spontaneously and at will by his ready brain, that the hundredth anniversary of his birth, which will come round upon the 22d of January, 1888, can hardly fail to be celebrated with becoming honor by Londoners, who recognize Milton and Byron, as well as Spenser and Chaucer, as the greatest poets born in this metropolis. There are some critics among us — and that Mr. Algernon Swinburne should be one of them is a cause for widespread regret — who pretend that Byron's rank among poets is not as yet fixed. Mr. Matthew Arnold, again, is of opinion that his great favorite, Wordsworth, "has left a body of poetical work superior in power, in interest, and in the qualities which give enduring freshness, to that which any other English poet has bequeathed to his fellow-countrymen, Shakespeare and Milton alone excepted." Now, Wordsworth composed verses during a space of sixty years, while Byron's entire literary career does not extend beyond fifteen. Yet we hazard little in saying that for every Englishman — and still more for every American, by which nation the ultimate rank and value of English poets will finally be appraised — acquainted with "*The Excursion*," there are at least one hundred to whom "*Childe Harold*" and "*The Prisoner of Chillon*" are precious possessions. It is said that the Canton de Vaud is about to repair the castle of Chillon, and to make it a residence fit for human habitation. We see no reason why one of the most interesting buildings in the world should not be rescued from damp and decay, so that it may afford shelter to happier human beings than the luckless prisoners who once pined within its gloomy dungeon walls. The lake which laves and gently kisses its foundations is said to be eight hundred feet deep beneath the windows which still dimly light Bonnivard's cell, and in the seven pillars which Byron has immortalized the iron rings to which the early reformers were chained are deeply embedded. The furrow wrought in the stone pavement by Bonnivard's footsteps during his six years of incarceration is still visible, and across his cell stretches a wooden beam black with age, from which, it is said, that the condemned were formerly suspended. We entertain no doubt that the dungeon occupied for many generations by nameless prisoners, and celebrated by Rousseau and Lord Byron, has long brought in a good revenue to the syndic of the canton in which it is situated. To be on the lake of Geneva without visiting Chillon would be tantamount to putting "Hamlet" on the stage without assigning a part to the Prince of Denmark. Even, however, if Chillon be repaired and modernized, the flow of English and American visitors will probably know no decline.

TRADE SURVEY.

If the railroad-building, manufacturing, and house and shop building interests have the wit to continue for a few months to come in the sensible policy circumstances have rendered it advisable for them to pursue for a year or two past, the favorable indications on all sides will become realities. If our political and social economy were sound, depressions would be less frequent than they are. The guarded expansion in all directions is simply wise economy. The increased compensation to labor is simply a step towards natural conditions. Increased production, if precipitated now, would find the country not quite ready for it. Values have found their lowest legitimate level; any further depression will come through bankrupt conditions, which are far from probable. It is well that builders, promoters and investors are as prudent as they are proving themselves to be. The consumptive appetite of the nation will not stand much over-loading; to over-load or over-crowd now would be to frighten back the spurt of extensive and liberal investments now apparent. That spurt must be permitted to work; to be, in fact, encouraged by higher prices and wider margins for a while. The investments of the past two years must be permitted to take deep root; all this could be done with eare; speculation will in this way be kept in check. The developments day by day point to no great change in the current. Heavy imports of gold are counted on, running into a score or two million dollars, to balance the international trade-scales. Financiers have been asked as to the wisdom of large investments on European account, not in speculative railway securities, but in more legitimate channels. Many of the evils society is supposed to be suffering from will be largely removed through the growing abundance of anxious capital. As has been often observed, competition heretofore has generally been between opportunities, each opportunity begging capital to come and make the most of it. Hereafter, competition will be within capital itself, each possessor seeking the best opportunity to increase his possessions. This is the characteristic of the present transitional era in industry and trade. A second is, the great near-at-hand outflow of the over-crowded masses into newer fields. Evils of government, and economic evils, will be largely corrected by dispersion, and the liberated energies will dash out into new directions. To-day the reports from the world's great centres show that an emigrating era is near. Business develops slowly. Last week's volume shows no marked increase. People do not know fully what to make of the strengthening tendency in prices. If they believed it would be legitimate, September would witness such a rush of orders and contracts as we have not seen for years. It is better the public should doubt and hesitate. Our safety is in conservatism. To boom things is to invite disaster next season. The farmers want first to market their grain, and the planters their cotton. The industries will take their cue from this. Three years ago we produced goods six months before we were sure we would need them and could pay for them. To-day the purchaser is in sight before the wheels begin to turn. Hence, demand is legitimate. Stocks are light; prices are firm, and confidence is universal.

The builders are almost everywhere busy and architects allow us to say that considerable additional fall and early winter work is on hand. Real estate in Western towns and cities has been changing hands freely all season and will hold the advance it has made until another season. Building activity is continuous in the Middle States, especially in Pennsylvania. Trust-companies and large money-lending corporations authorize the statement that mortgages are being wiped out faster than new obligations are created in the New England and Middle States. This does not apply so forcibly to the Western and Southern States, where money is in urgent demand for industrial and commercial purposes. Builders are pleased at the success met with in selling and renting houses, especially in smaller cities where the manufacturing spirit is penetrating. Building material continues low. Lumber shows some firmness in Western markets, but continues rather weak in Eastern, where buyers have opportunities offered to stock up at early season prices. Receipts are heavy in yellow and white pine and in all the hardwoods used by house-builders and furniture-manufacturers. The iron and steel makers report further activity and greater strength especially in bar-iron. Nails are strong at $2.10 in tide-water markets and merchant steel is moving freely at fair quotations. A great deal of money is being spent by municipalities big and little, by railroad managers, shop and mill owners and by manufacurers generally in extensions and improvements. The textile manufacturers are content with moderate returns in dividends and are liberal in the purchase of machinery and supplies. The coal producers talk discouragingly about the markets but it should be remembered the anthracite production is 1,500,000 tons ahead of its limit at this date last year and the soft and block coal miners are also ahead. In other industries good reports are submitted. For instance, in the item of school, church, bank and office furniture the sales according to several good sources of information are ten to fifteen per cent in excess of last year, even in the face of failures at one or two points. The commercial failures show a healthy falling off. Few grave labor complications have arisen. Employers are gradually getting together for better mutual understandings, the effect of which will be to minimize competition and to establish fixed value for labor and its products. Arbitration is growing in favor as a temporary make-shift and coöperative enterprises for productive purposes are springing up every week on a small scale. The Minneapolis coopers have accomplished good results. Cigar-makers, carpenters, broom-makers, coal-miners and rug-makers have within a short time made a good start, but the memory of past failures remain to warn the promoters of these enterprises of the dangerous work they have entered upon.